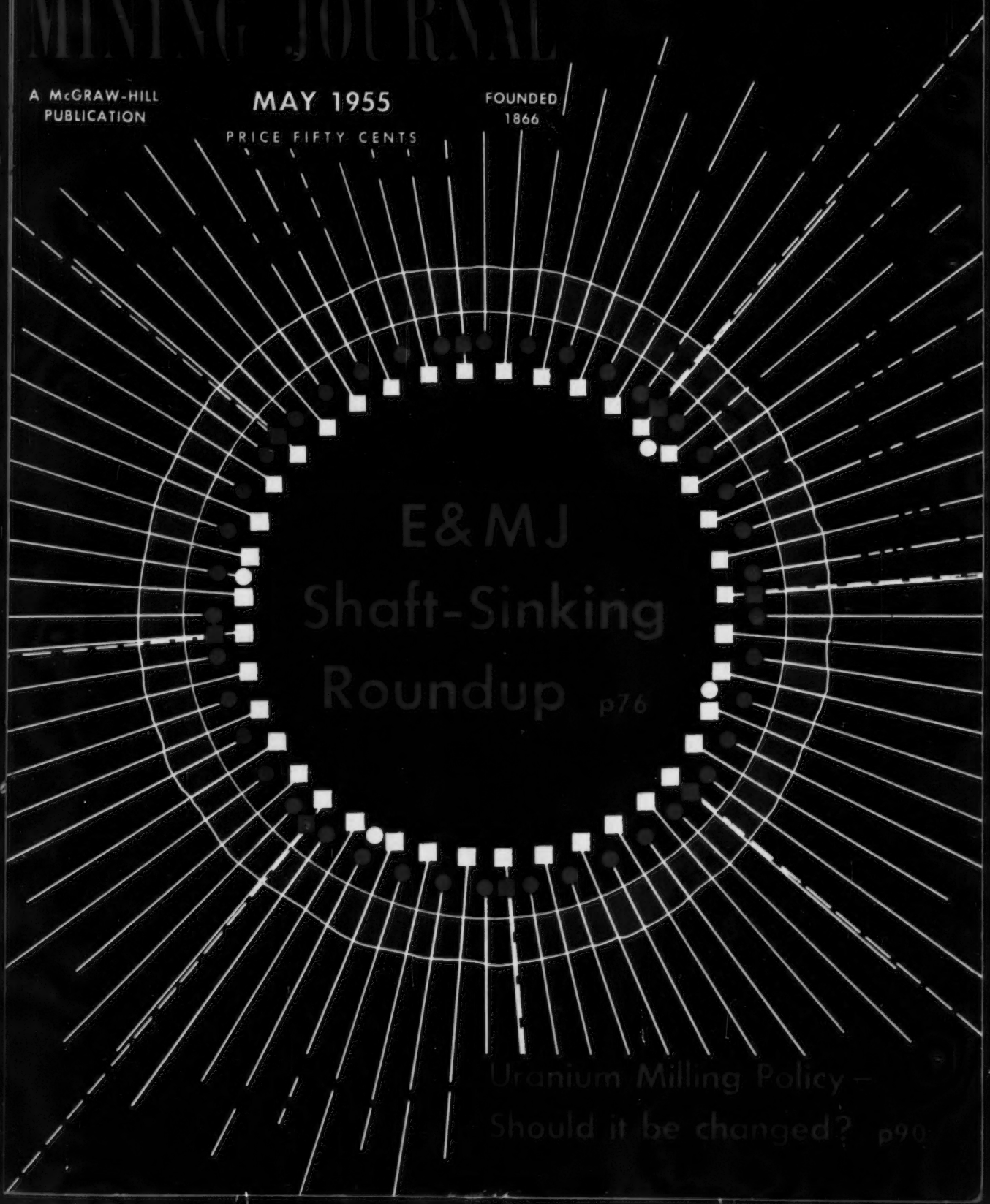
ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

MAY 1955

PRICE FIFTY CENTS

FOUNDED 1866

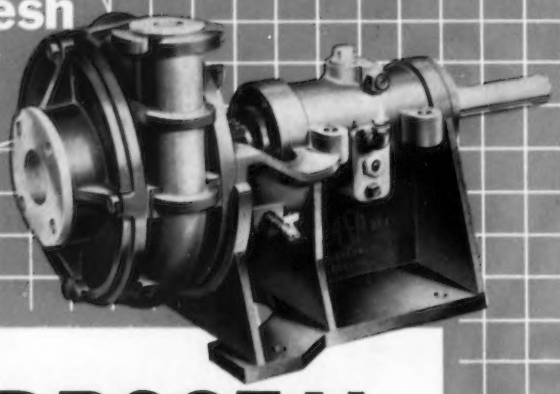


E&MJ Shaft-Sinking Roundup p76

Uranium Milling Policy — Should it be changed? p90

If you are pumping abrasives

35 to 4 mesh
100% minus ¼"



HYDROSEAL
RUBBER-LINED
Sand Pumps

are required equipment on these two counts—mechanical efficiency and long-range economy. With a high suction lift or an extreme inlet pressure, these pumps will achieve maximum head. Their close clearances protected by a flow of seal liquid, they'll maintain their initial high efficiency up to when one of their long-wearing Maximix Rubber parts needs replacement. Because you never need an oversize HYDROSEAL and motor as allowance for wear, you'll save as much as ⅓ to ½ in power costs.

400 to 48 mesh
100% minus .0116"

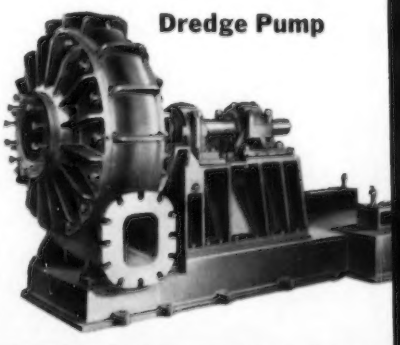
INTERCHANGEABLE

HYDROSEAL Slurry Pump
(Sealing water)

CENTRISEAL Slurry Pump
(No Sealing water)

3 mesh—.263"
and larger to 6"

HYDROSEAL
Dredge Pump

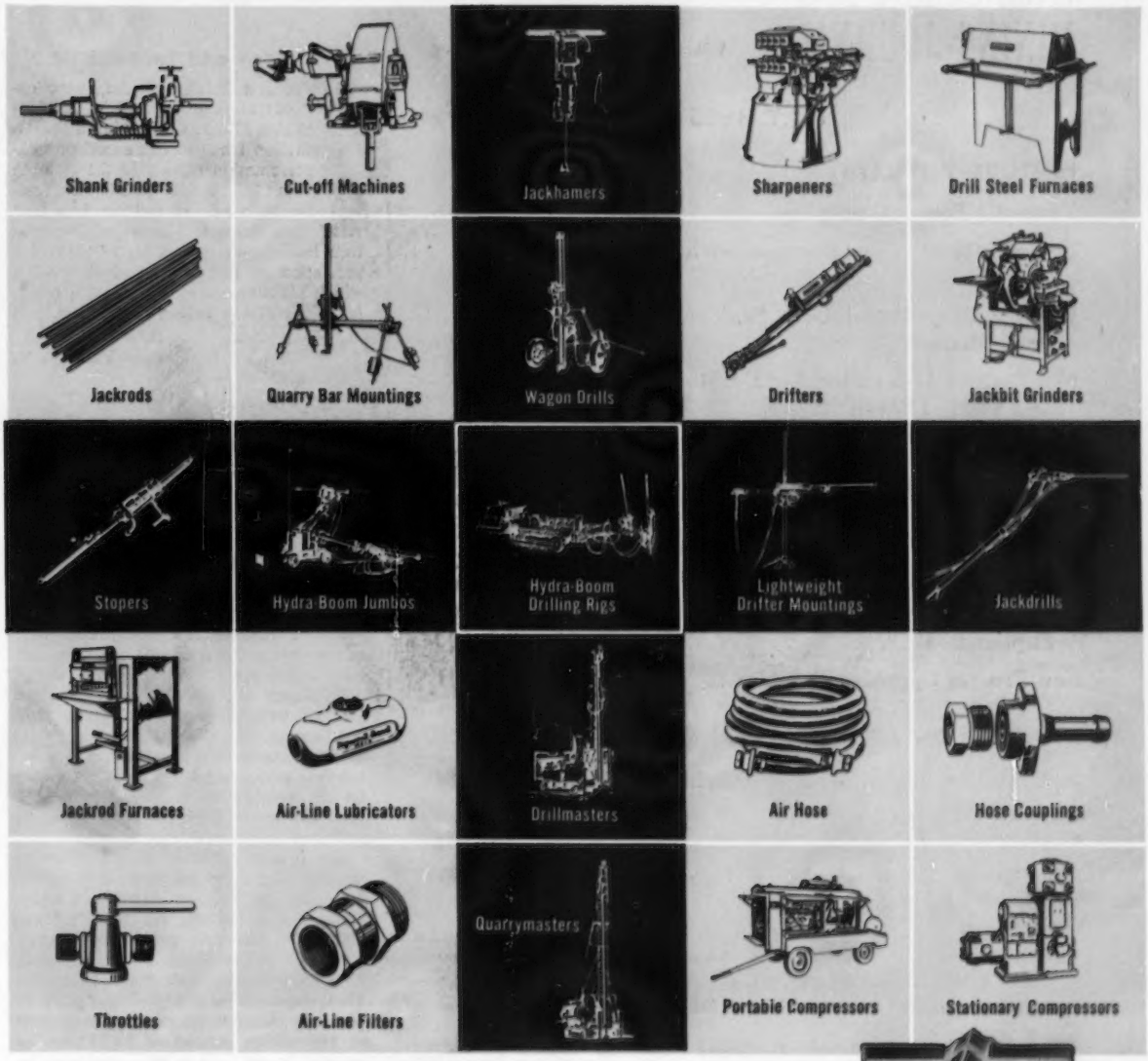


For the whole story of advantage to you, write for Hydroseal Catalog No. 953.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

HYDROSEAL and CENTRISEAL
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

the big **PLUS VALUE**



behind every I-R
CARSET JACKBIT

YOU can't drill rock with a *bit* alone. But behind every Ingersoll-Rand Carset Jackbit there's a COMPLETE LINE of rock drilling equipment.

Whatever you need for drilling rock – from the bit all the way back to the compressor – you can be sure that Ingersoll-Rand can help you. From one source with undivided responsibility you get a coordinated line of equipment that's designed and built to work together. You get complete *service*, too – backed by over 80 years of experience and leadership in the rock drilling field.

That's a big *plus* in your favor when you make Ingersoll-Rand your headquarters for everything in rock drilling.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

15-232

ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO BLOWERS
CONDENSERS • PUMPS • OIL & GAS ENGINES

ENGINEERING AND MINING JOURNAL

89th YEAR OF PUBLICATION

VOL. 156 No. 5

MAY 1955

FEATURE ARTICLES

Toward A Better Mining Industry 68

Free World Uranium Reserves—Where Do We Stand? ..... Jesse C. Johnson 75

How Southwest Potash Corp. Sank and Sealed Two Concrete Shafts ..... Ira A. Herbert 76

New Positive-Action Mucking Machine Works in Incline and Vertical Shafts ..... Roger V. Pierce 82

Why Anaconda "Raised" the Kelley Shaft ..... A. D. Rood 85

What Can Be Done About the "Uranium Milling Bottleneck?" 90

"Make-It-Yourself" Explosive Shatters Blasting Costs ..... Harold Davis and A. E. Flowers 96

The Copperhill Ball Mill—A Mathematical Explanation ..... John P. Zannaras 100

New Process Upgrades Taconite 101

REGULAR DEPARTMENTS

New Products Digest ... 35

Outlook ... 67

Markets ... 69

This Month in Mining ... 72

Behind the By-Lines ... 74

Washington Impact ... 102

New Books ... 104

Operating Ideas ... 105

Personals ... 108

Carl Coash ..... Publisher

Alvin W. Knoerr ..... Editor

George P. Lutjen, Managing Editor

Hans H. Wanders, Market Editor

Lloyd E. Antonides, Assistant Editor

John B. Hutti, Associate Editor, San Francisco

George H. Cleaver, Assistant Editor; Markets

McGraw-Hill Washington Bureau

Daniel P. Eigo, News Editor

Berke Musselman, Natural Resources

Nancy Parkes, Copy Editor

F. Alvin Zimmerli, Assistant Editor; Layout

Alan E. Adams, Labor

Published monthly, with an additional issue in mid-March, by McGraw-Hill Publishing Co., Inc., James McGraw (1860-1948), founder.

Executive, Editorial, Advertising and Subscription offices: McGraw-Hill Building, 330 West 42nd St., N.Y. 36, N.Y. Publication Office, 1309 Noble St., Philadelphia 23, Pa. Donald C. McGraw, president; Paul Montgomery, executive vice president; Joseph A. Gerardi, vice president and treasurer; John J. Cooke, secretary; Nelson Bond, executive vice president. Publications Division; Ralph B. Smith, vice president and editorial director; Joseph H. Allen, director of advertising; J. E. Blackburn, Jr., vice president and circulation director.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 330 West 42nd St., N.Y. 36. Allow one month for change of address.

Subscriptions are solicited only from management, production and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

Branch Offices and District Managers: Atlanta 3, S. T. Henry; Chicago 11, F. W. Roets, G. A. Mack; Cleveland 15, W. M. Spears; Dallas 1, J. H. Cash; Los Angeles 17, W. C. Woolston; New York 36, T. E. Alcorn, J. B. Lewis; Pittsburgh 22, H. C. Chellson; Philadelphia 3, J. B. Lewis; St. Louis 8, F. W. Roets; San Francisco 4, J. W. Otterson; Washington 4, D.C. London address: McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon St., London E.C. 4, England. Cable address: McGRAWHILL, London. News Bureaus: Atlanta 3; Cleveland 15; Detroit 26; Houston 25; San Francisco 4; Washington 4. World News Offices: London, Frankfurt, Manila, Mexico City, Paris, Sao Paulo, Tokyo.

Price of this issue 50c. Subscription rates: United States and possessions $3 a year; $4 for two years; $5 for three years. Canada $5 for a year; $8 for two years; $10 for three years. Other Western Hemisphere, $6 a year; $12 for two years; $16 for three years. Elsewhere, $15 a year; $25 for two years; $30 for three years. Please indicate position and company connection in all subscription orders.

Entered as second class matter May 24, 1951 at the Post Office at Philadelphia, Pa. under the Act of March 3, 1879.

Copyright 1955 by McGraw-Hill Publishing Co., Inc. All rights reserved. Printed in the U.S.A.

LETTERS

Men and Taconite

I have just finished reading your excellent presentation on Taconite development of Erie Mining Co. in March *E&MJ*. One reaction I had to this excellent technical presentation related to the opening comments of the article. It is heart warming to people like myself, in industrial relations activity, to find technical literature leading off with a well-written appreciation of leadership and staff work which makes possible the physical manifestations of our industrial progress.

R. M. Mahoney
New York, N. Y.

"Financial Viewpoint"

Table 5 in Professor Kellogg's admirable article, "Titanium's Future" (*E&MJ*, April 1955), might call for a little comment from a financial viewpoint.

The author observes that financing an investment of this type (30,000-ton plant to cost $104-million) would most likely come from the accumulated capital of a large mining and metallurgical company. With such in mind, the author allows ten years to amortize the investment, with net income per year of $10.5-million after costs and taxes.

In theory this would leave the plant free of write-offs after ten years, with net income thereafter of about 10% on the investment. It is true that during the ten-year period there would be no return on the investment, but expectation of a generous return after ten years might be sufficient inducement.

But it appears likely that a financing scheme could be adopted that would prove less burdensome. Instead of amortizing over a ten-year period, advantage might be taken of rapid amortization over five years, which would permit a 20% depreciation rate instead of 5%. Thus, depreciation of $19-million per year could be obtained on process investment of $95-million instead of $4,750,000 as allowed by the author. This would make net before taxes of $5.5-million instead of $11.9-million, or $5.0-million net after tax.

The cash flow would therefore be $24.0-million instead of $11.9-million as shown as net income in the table. If the $104-million plant investment were obtained by bank loans or serial notes, bearing 4 or 5% interest, instead of being taken from accumulated capital the interest charges could be added to costs before calculating income subject to income tax, which would still further reduce tax liability and increase cash flow by the extent of the tax reduction.

The net result could be that the cost of the plant could be amortized in a considerably shorter time than allowed by the author. This assumes, of course, that Washington would continue to allow rapid amortization.

W. F. Boericke
New York, N. Y.

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Shakedown by three rubber toughs

A typical example of B. F. Goodrich improvement in rubber

COAL gets packed in those freight cars so tight it won't come loose when the hopper at the bottom is opened. Men used to crawl in the car and using pick and shovel, break it loose. Sometimes it took two men eight hours to unload a car, and more important, it was dangerous.

Then a machine was developed that's put on the side of the car and shakes the material loose. The shaking is done by three B. F. Goodrich Grommet V belts driving a shaft that's out of round and off balance. Many kinds of V belts were tried but broke from the teeth-chattering vibrations.

But the B. F. Goodrich V belt, with two husky grommets imbedded deep in rubber, can take and recover from shock with no ill effects. A grommet is made by winding rayon cord into an endless loop. Now, push a button and the cars are unloaded in ten minutes.

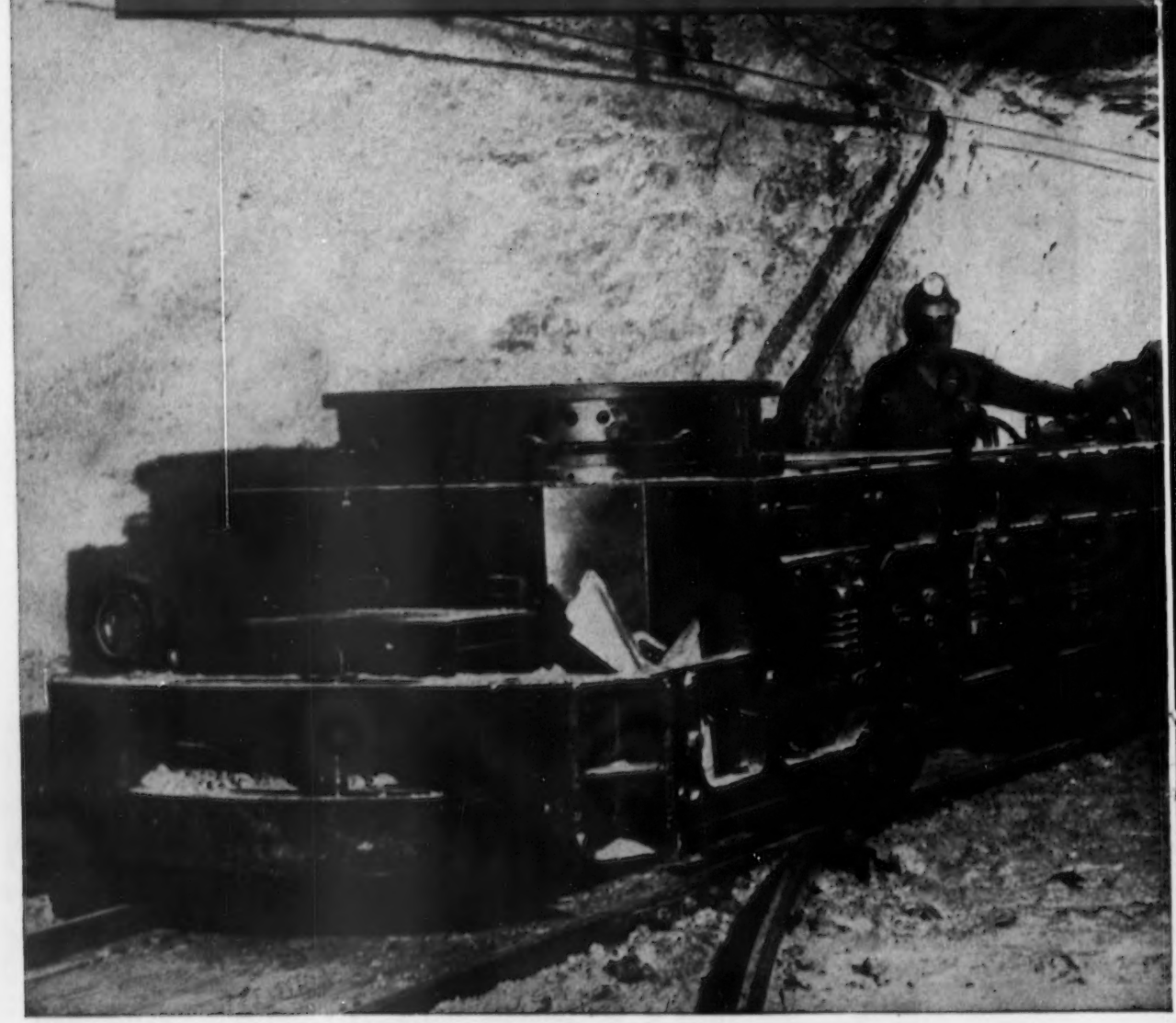
Product development and improvement are always going on at B. F. Goodrich. Every product B. F. Goodrich makes—V belts, conveyor belts, hose and many other things—is constantly being studied to see how it can be made to last longer and do a better job.

How this cuts your costs: Biggest cost savings almost always come from top performance rather than lowest prices. If you use rubber products, remember B. F. Goodrich is one company that will *never* lower its quality standards. This means you can be sure of top performance and real money savings when you buy from your B. F. Goodrich distributor. *The B. F. Goodrich Company, Dept. M-406, Akron 18, Ohio.*

Grommet—T. M. The B. F. Goodrich Co.

B.F. Goodrich
INDUSTRIAL PRODUCTS DIVISION

GET EASIER STARTS THIS EASY WAY



TUNE IN...TEXACO
STAR THEATER
starring
DONALD O'CONNOR
or JIMMY DURANTE
on television...
Saturday nights, NBC.

TEXACO

TEXACO

JUST lubricate mine car wheels with *Texaco Olympian Grease* and see how much more easily your trains start — *winter as well as summer!* And of course, easier starts mean longer trains, more tonnage moved.

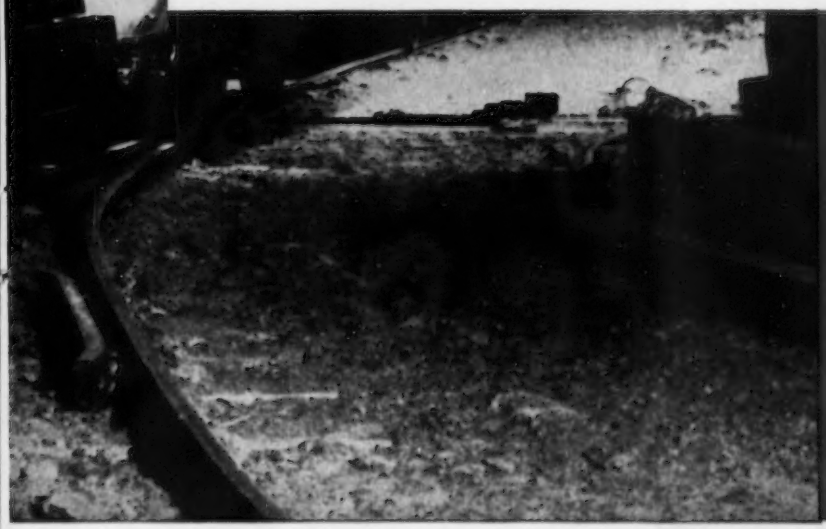
Texaco Olympian Grease is especially made for this service. It has high resistance to oxidation, will not separate in storage or in use, and it stays in the bearings. This assures longer lasting protection against dirt, moisture and wear . . . reduces maintenance costs.

You can get *Texaco Olympian Grease* in three consistencies — to meet all requirements of plain, cavity hub or anti-friction bearings.

To lubricate wire rope and open gears, use *Texaco Crater* or, for added application convenience, *Texaco Crater X Fluid.* These famous products provide tough, long-lasting protection . . . keep wire rope strong longer . . . assure longer gear life.

Let a Texaco Lubrication Engineer explain the many ways in which effective lubrication — *Texaco* — can help you increase efficiency and reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.



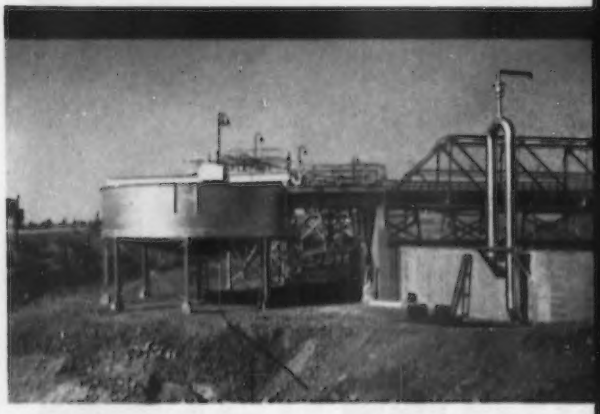
FOR OVER 20 YEARS, MORE COPPER ORE HAS BEEN MINED IN THE U. S. WITH TEXACO-LUBRICATED EQUIPMENT THAN WITH ANY OTHER.

Lubricants and Fuels

FOR THE MINING INDUSTRY

Tailings Handling Made Easy

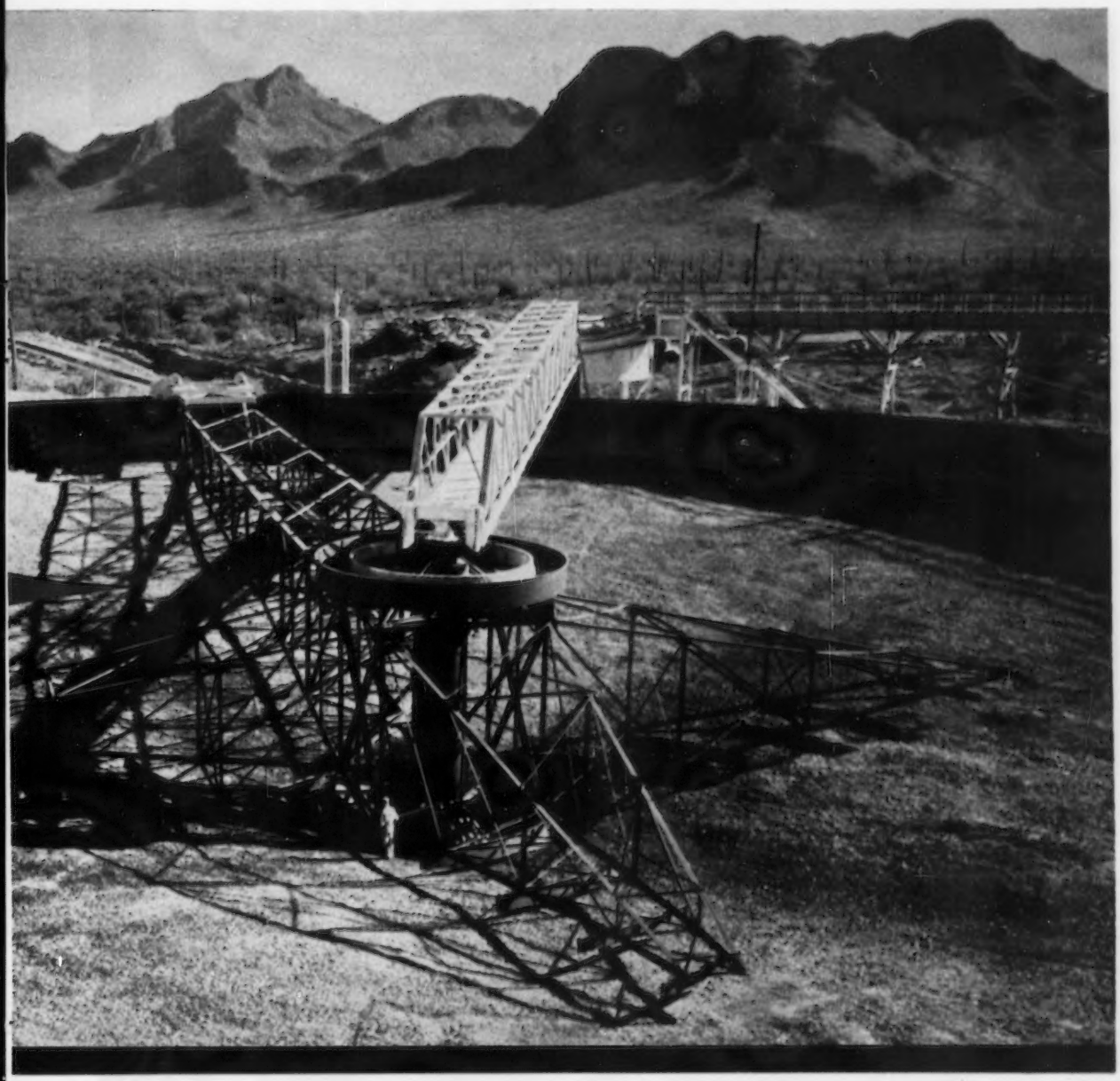
Closeup of 275 ft. dia. Dorr Thickener during final stages of construction. Part of Hydroseparator is visible behind walkway.



Hydroseparator at left with part of Thickener at right.

7450 TPD of copper tailings can be a big headache without proper disposal facilities. At a new Concentrator in Arizona the proven Dorr Hydroseparator-Thickener team is taking shock loads and variable feed characteristics in stride.

The giant Thickener — 275 ft. in diameter — dominates the picture. But equally important to successful operation is the 30 ft. diameter Dorr Hydroseparator.



By scalping out oversize material ahead of the Thickener, the Hydroseparator boosts thickening capacity and cuts water losses in the underflow.

We'd like to tell you more about Dorr-Oliver's ability to provide the correct solution to tailings handling problems. Just drop a note to Dorr-Oliver Incorporated, Stamford, Conn. or in Canada, 26 St. Clair Ave. East, Toronto 5.

DORR-OLIVER
INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U.S.A.

Increase hardfacing production

Constant arc length regardless of operator movement or surface roughness.

HOW THE AMSCO MF WORKS

Bare mild steel electrode continuously feeds through the welding cone. It is magnetically coated with flux of your choice—manganese steel build-up or hardfacing alloy—at the point of the cone. Electrode feed is automatically regulated so that a constant arc length is maintained. Full coil lengths of electrode are consumed, with no loss of stub ends.

automatically...with the

NEW AMSCO® MF WELDER

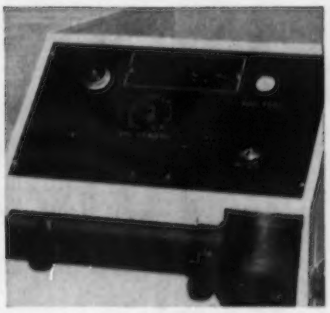
You steer the cone... the Amsco MF does the work. You lay down more metal in less time, because this welder uses a small diameter electrode and high current densities, which allow a high deposit rate without tiring the operator.

Electrode feed is continuous, and automatically regulated to maintain a constant arc length. This assures a more uniform bead by compensating for operator hand movement and irregular welding surfaces.

Welding is by open arc so you can see what you're doing. The Amsco MF is portable. It plugs into any standard welding unit. It requires no special setup.

See a demonstration of the Amsco MF —its speed, quality of weld and uniform deposit. See how easy it is to operate. Try it and you'll think of many more reasons why it will save hardfacing time and labor costs. Your Amsco Distributor is ready to show it to you now.

Flux held in cone contains the welding alloy you require.



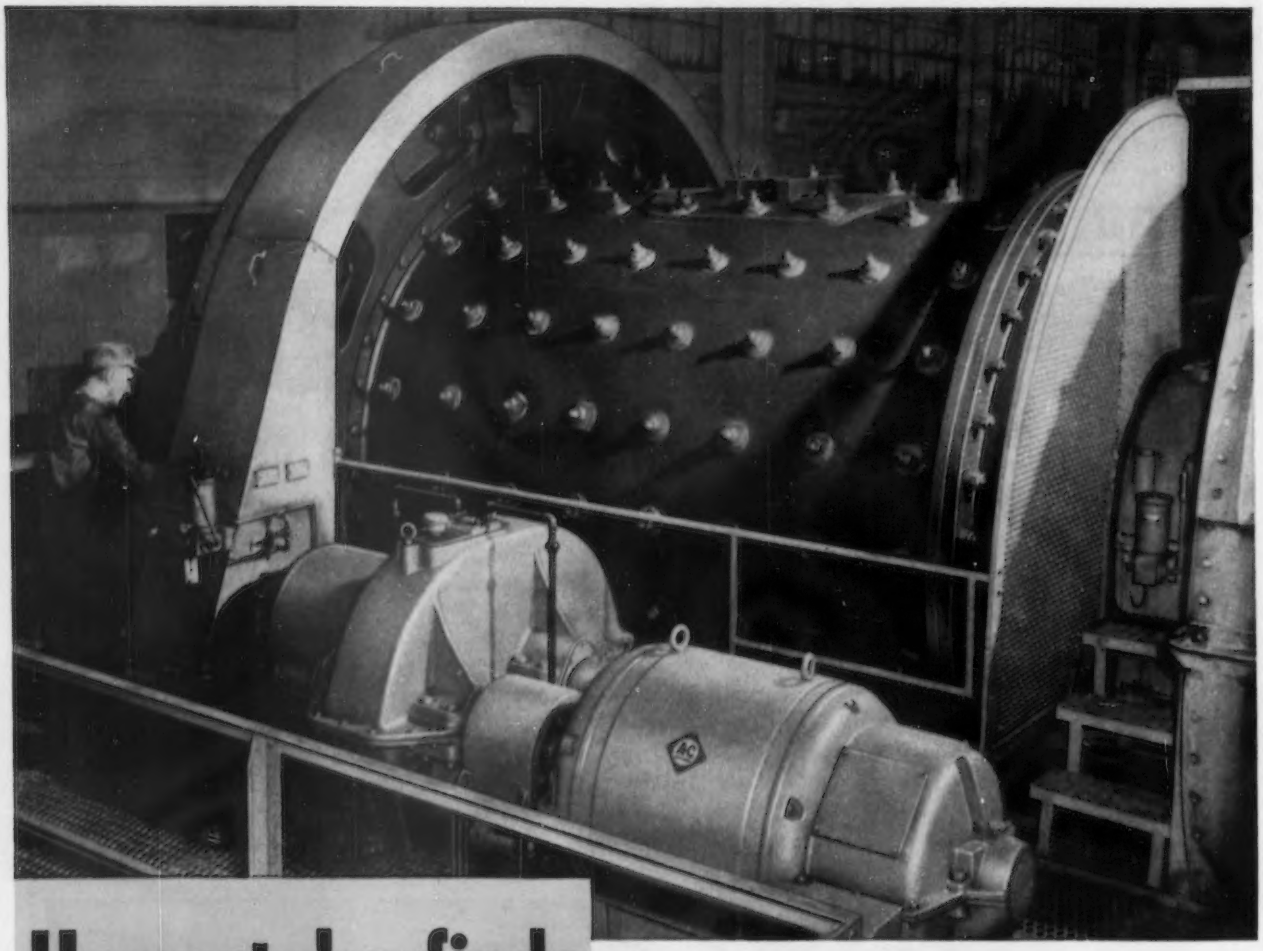
Easily identified, easy to operate panel controls.

Uses small diameter, coiled, bare mild steel electrode.

SEE YOUR AMSCO DISTRIBUTOR • HARDFACING HEADQUARTERS

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Illinois



Homestake finds Gold in MODERNIZATION

Industry's Top Technical Team Helps Reduce Operating Costs

A 2.25 kwhr saving per ton in power consumption — a 37½% reduction in operating labor—a similar saving in maintenance and supply work — considerable space conservation. These benefits realized by Homestake Mining are gilt-edged proof that modernization pays.

Pressured by increasing labor and material costs, in the face of a fixed price on gold, Homestake took a long, hard look at its gold ore operation. With the *help of Allis-Chalmers*, the Homestake staff made a comprehensive study of all phases of ore treatment. Crushing and grinding flow sheets were drawn up and costs estimated. Machines were operated under varying conditions. Power measurements, product analyses and man-hour appraisals were made in a pilot plant run.

As a result of this thorough investigation, a modernization program was launched in each of Homestake's two crushing plants and mill. New equipment was installed and procedures modified to make existing equipment as efficient as possible. Two years of profitable operation have proved that Homestake Mining has struck a rich vein in modernization. A-4470

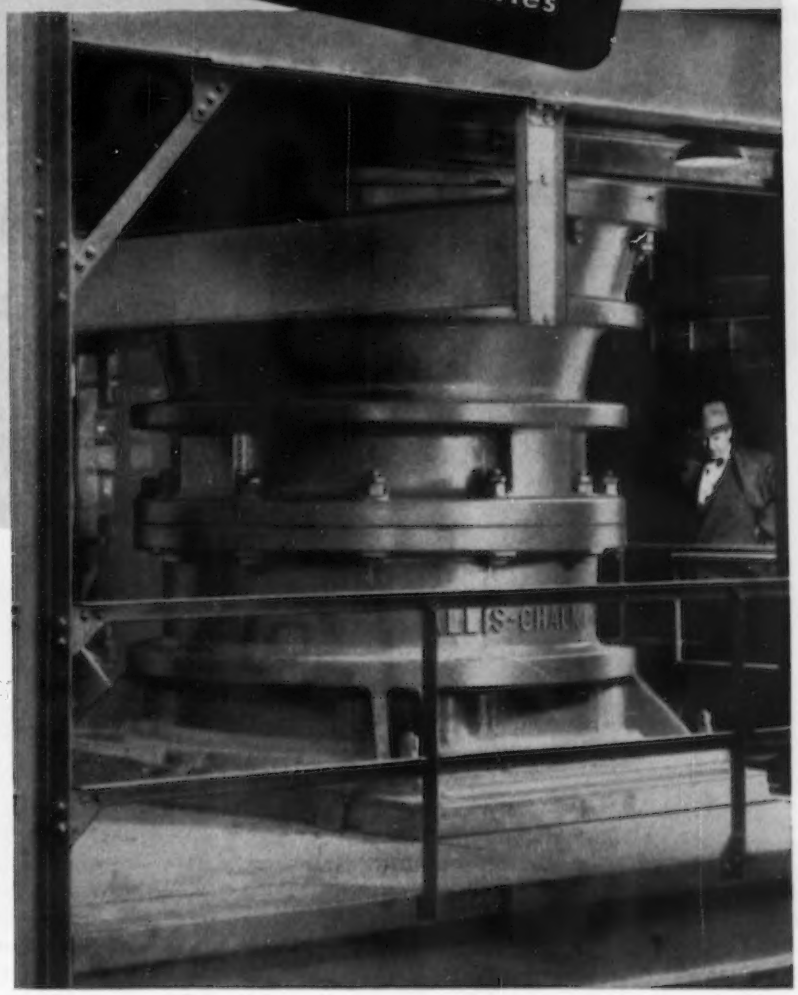
ALLIS-

Prominent in the modernization picture at Homestake are three 9 by 11-foot Allis-Chalmers ball mills. These mills, used in the amalgamation process, are equipped with combination drum and double-scoop feeders. Liners are of the Lorain type with hardened lifter bars. Ball additions are 1½ to 2 inches. The mills are driven by 450-hp, 1200-rpm Allis-Chalmers motors through speed reducers.

In each of Homestake's two crushing plants, a modern 30 — 55 *Superior* gyratory crusher has replaced two outmoded 17-inch primary crushers. The new crusher outproduces the combined tonnage of the old crushers and takes up less than half the space. The wearing quality of manganese steel mantles and the strength of short, rigid mainshaft have cut maintenance and parts replacement costs.

Superior is an Allis-Chalmers trademark.

ALLIS-CHALMERS
Equipment for the
Mining and Rock
Products Industries



For as Much Help as You Want or Need in Your Modernization Planning, Contact Allis-Chalmers

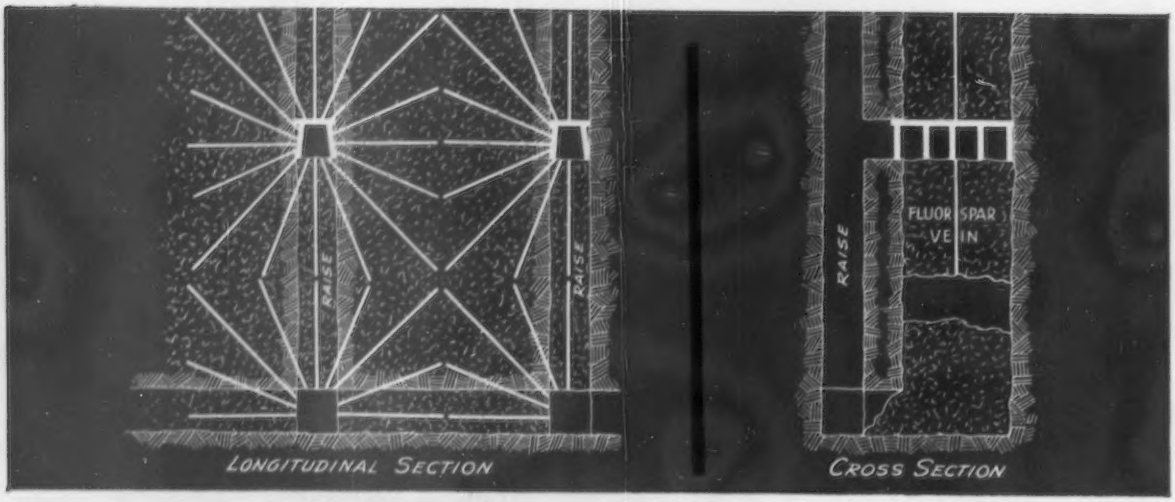
Your A-C representative, backed by industry's top technical team, is always ready to help you or your consultants. A-C interest in your problems does not end with the installation of equipment. Laboratory facilities, periodic checkups, maintenance and fast emergency parts service are yours continuously.

Crushers—all types
Vibrating Screens—all types... Grinding Mills—all types
Kilns...Coolers...Washers...Dryers...Smelting Equipment

CHALMERS

A-C ALLIS-CHALMERS

For complete information, call your Allis-Chalmers district office or write Allis-Chalmers, Milwaukee 1, Wis.

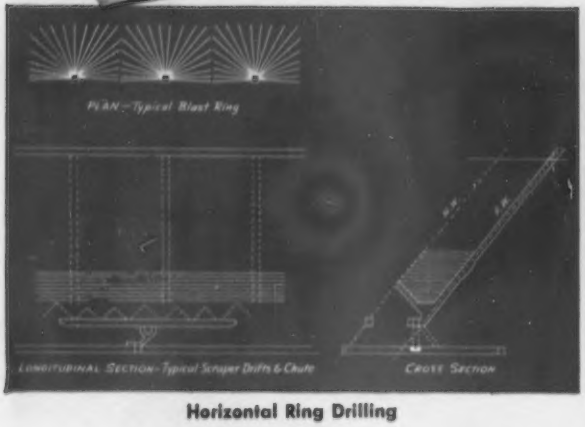


Vertical Ring Drilling

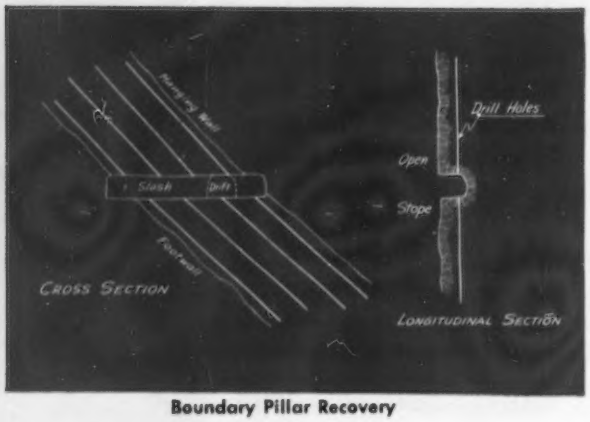
never before

...A BOOK LIKE THIS!

New deep hole drilling applications point the way to cost-saving underground mining methods with Gardner-Denver equipment engineered for deep hole percussion drilling.



Horizontal Ring Drilling



Boundary Pillar Recovery

Send for your copy today! 24 pages! No cost or obligation.

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

HANDLING ORE isn't the only mining problem!

Northwest Model 6 using an 85 ft. boom erecting an ore crushing plant at Ogdensburg, N. J.

Those jobs around the mill—construction work, setting machinery, loading and unloading of equipment and materials—there's the place for versatility and a machine that you know is always ready to go.

Your Northwest will handle any lifting problem and it is easily converted to a standard shovel or dragline without any major dismantling. As a crane it brings you the ability to handle the high, tricky jobs or it can lay a boom out flat and, of course, it can be equipped with all standard attachments from a clamshell or hook block to a magnet.

The "Feather-Touch" Clutch Control makes operation easy, without resorting to delicate mechanisms that often require special knowledge for adjustment. Uniform Pressure Swing Clutches eliminate the jerks and grabs that cause dangerous boom whipping and swinging loads.

A wide range of Boom Hoist Equipment assures the right combination for any hoisting condition and makes possible a selection for one, two or three load lines with or without a live boom.

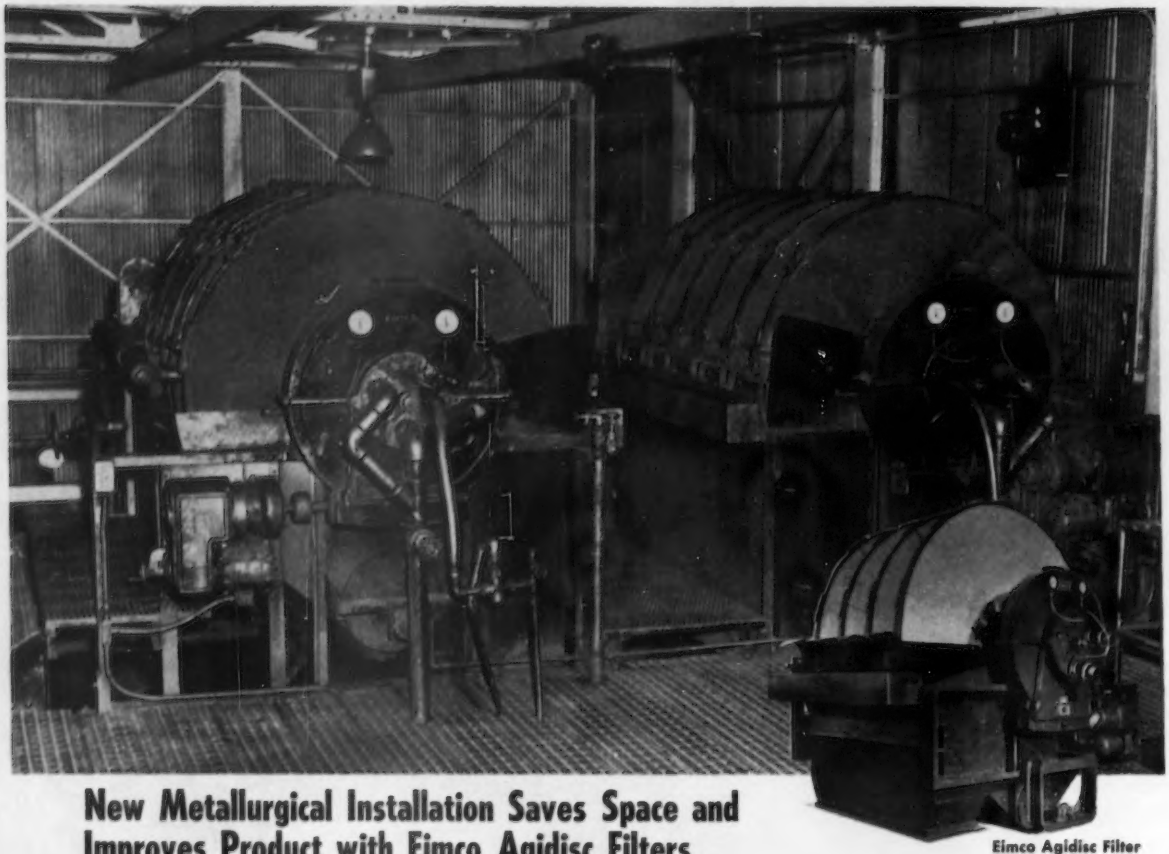
You should check into many other Northwest advantages. Northwest Traction, the Northwest Cushion Clutch, the Helical Gear Drive, Northwest Power Plants and other features—but, most of all check with Northwest Owners and you will find that Northwest is the machine you can always count on when you need it. Ask for a catalog on the capacity machine you need.

NORTHWEST ENGINEERING COMPANY
1509 Field Building • 135 South LaSalle Street • Chicago 3, Illinois

YOU CAN'T HAVE NORTHWEST ADVANTAGES UNLESS YOU OWN A NORTHWEST

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem



Eimco Agidisc Filter

New Metallurgical Installation Saves Space and Improves Product with Eimco Agidisc Filters

The photo above shows an installation of two 6′ diameter by 5 disc Eimco Agidisc Filters in their operating position in a new metallurgical concentrating plant.

These filters were installed as a result of the owner company and Eimco cooperation in a joint effort to improve the operation of the filter station at this plant and reduce moistures with the most economical equipment.

After the installation had been operating for six months the following data was made available.

	PREVIOUS EQUIPMENT	NEW EIMCO FILTERS
1. Concentrate handled	350,000 lbs./24 hrs.	350,000 lbs./24 hrs.
2. Labor required	1 man full time	1 man part time
3. Attention required	Constant inspection	Periodical inspection every 6-8 hrs.
4. Operating Capacity	Full load—no capacity for additional tonnage	½-¾ load—capacity for 33% to 100% additional tonnage
5. Equipment	4—Drum filters (not Eimco)	2—6′ dia. x 5 disc Eimco Agidiscs
6. Filter area	621 sq. ft.	500 sq. ft.
7. Floor Space occupied	416 sq. ft. filters only	189 sq. ft. filters only
8. Cake Moisture	20%—21%	14%—15%
9. % Moisture reduction over previous method		33%
10. Filter rate increase over previous method		more than 15%

Eimco specializes in equipment to do a better job in filtration. Before you buy, take advantage of Eimco's experience in building filtration equipment for customers who look beyond first cost to get quality construction, individual design and guaranteed performance.

THE EIMCO CORPORATION
Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City
New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa.
Pasadena, Calif. Houston, Texas London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa
B-102
PAN
CONTINUOUS PRESSURE
PRESSURE PRECOAT
BI-CARB
PRESSURE ROLL
BURWELL

After TWO years of field-testing, here's the

NEW IMPROVED TIREX CORD

- *It's more flexible than ever before!*
- *It has greater pliability when cold!*
- *It's much easier and faster to machine-strip!*

New TIREX CORD retains its Selenium Neoprene Armor for added toughness.

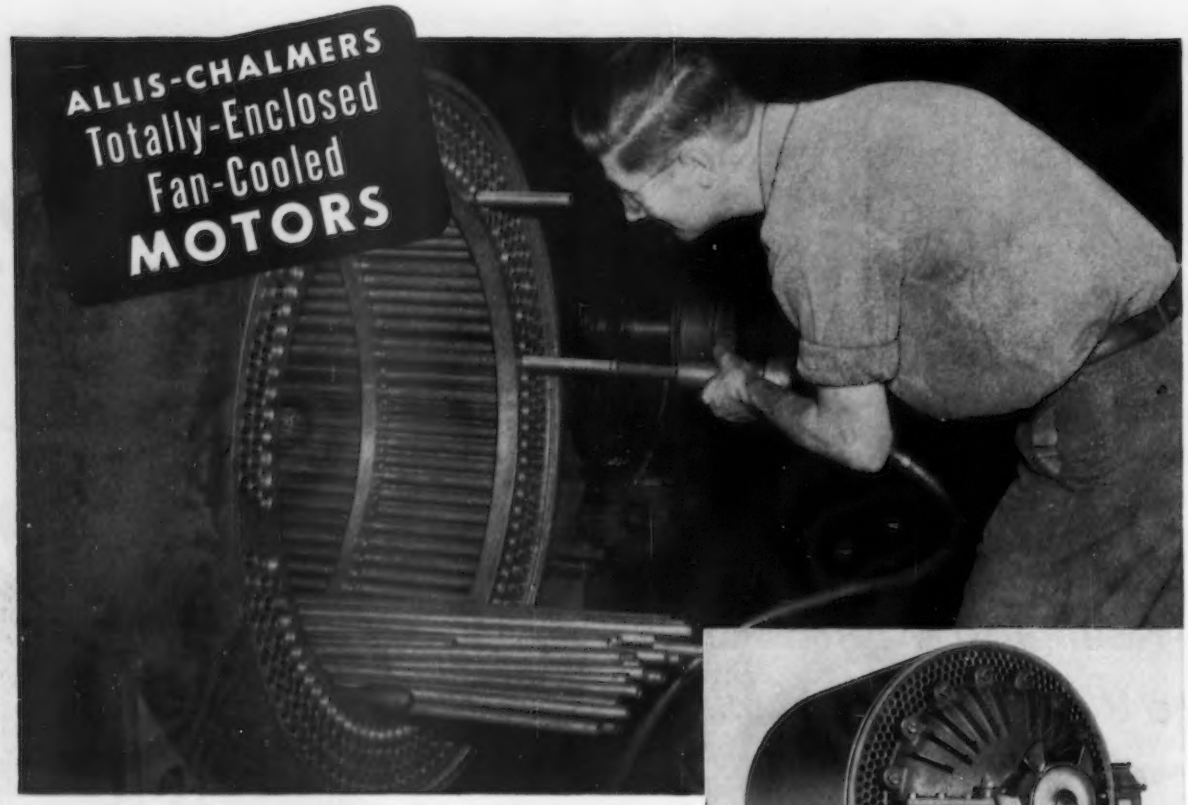
New TIREX CORD is still cured in lead to make it smoother, denser and more uniform.

Simplex TIREX

The New TIREX is the most supple, limber TIREX Cord ever made!

Find out more about the New TIREX CORD. Write to the address below for Folder 1022 today.

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.



3600-rpm explosion-proof motor with fan housing removed to show unidirectional fan.

These heat exchanger tubes

Protect this motor from dirt and corrosion

COOLING AIR is carried through the heat exchanger tubes with sufficient velocity to expel practically all kinds of dirt. If oily or sticky dirt should cling, tubes can be ramrodded clean on the spot in a few minutes because tubes are straight and tube ends are exposed. Also, the tubes are distributed uniformly around the perimeter of the stator yoke and along its full length — cooling all parts of the motor evenly.

Choice of Corrosion-resistant Materials

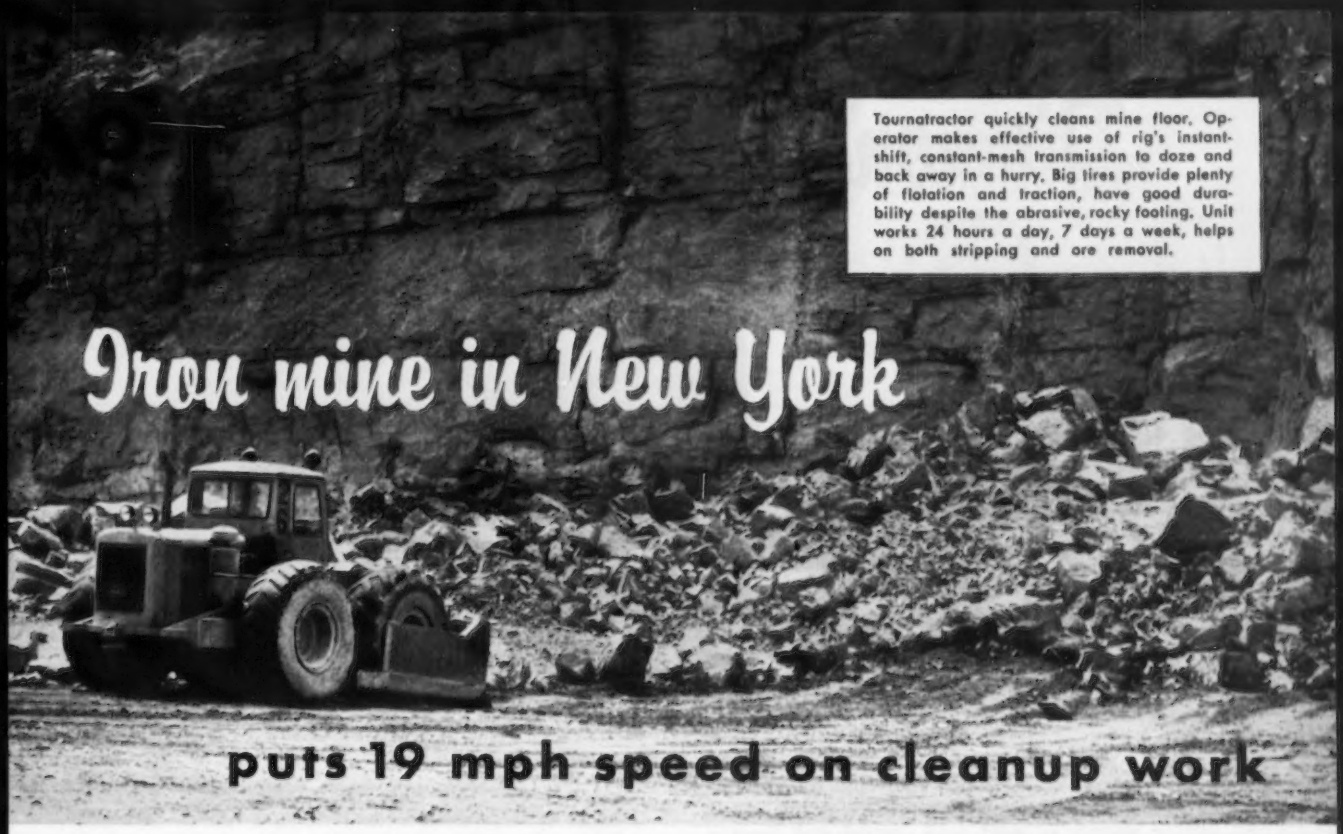
You can lick corrosion with this motor, too. Tubes are available in a variety of materials to meet practically any corrosive atmospheric condition. Allis-Chalmers tube-type motors have long and successful experience in such difficult applications as caustic plants, refineries and petrochemical plants, power plants with fly ash problems and many others.

Get Complete Information

Next time you need a motor for a dirty or corrosive location or for outdoor operation in all kinds of weather, call your Allis-Chalmers District Office. Get complete information on Allis-Chalmers tube-type totally-enclosed, fan-cooled and explosion-proof motors. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B7149. Available in ratings on frames larger than NEMA 505 up to 3000 hp.

A-4559

ALLIS-CHALMERS



Tournatractor quickly cleans mine floor. Operator makes effective use of rig's instant-shift, constant-mesh transmission to doze and back away in a hurry. Big tires provide plenty of flotation and traction, have good durability despite the abrasive, rocky footing. Unit works 24 hours a day, 7 days a week, helps on both stripping and ore removal.

Iron mine in New York puts 19 mph speed on cleanup work

- **Rubber-tired tractor clears mine-floor after blasting**
- **Rig also cleans up around 4½-yd. shovel**
- **In winter, plows snow from haul roads and blast areas**

With drilling and blasting done throughout the day along an ore body two miles in length, this New York open-pit iron mine has a major cleanup problem. They have licked the problem with the speed and maneuverabilty of a rubber-tired Tournatractor.

On the relatively long runs between operating faces, this 19 mph rig makes a much faster trip than could a crawler-tractor. Another advantage of Tournatractor is that it does not cut-up the surface of the haul roads like a crawler does.

During winter, Tournatractor also finds time to plow snow from the pit roads and loading areas. It also clears areas to be blasted. This keeps snow from getting mixed in with the shot rock and later from causing trouble inside the crushers.

"Excellent on night shift"

For work on the night shift, owners are particularly pleased with the lights on their Tournatractor. They find that "night work does not slow this rig nor put any limitations on areas where it can travel or work."

For proof of these advantages, ask for a demonstration *in your pit* of this high-speed 208 hp machine. See for yourself how quickly and how economically it will handle your scattered pushing, pulling and dozing jobs.

The ore body being mined here was discovered in 1810 by engineers surveying a military road between Albany and Ogdensburg. Only a small amount of iron was removed, however, until 1944 when modern methods of beneficiating magnetite and low-grade non-magnetic martite ores made the operation profitable. This year, 1,300,000 gross tons will be processed. All will be taken from a deposit slightly over 2 miles long and 200′ to 1400′ wide. Iron content averages 24%. Overburden includes a structural hanging wall of granetized gneiss, plus up to 60′ of glacial drift (mostly sand, hardpan, and boulders). Height of operating faces is set at 50′ except for some first cuts of 100′. Drilling is made with 42-T and 50-T churn drills, with chrome-nickel-moly bits of 4340 grade. Nine-inch primary holes are spaced about 23′ apart and burden at toe is kept as close to 20′ as possible. Every pound of explosive breaks about 2.35 gross tons of crude ore. This is loaded by 4½-yd. shovels into 22-ton rear-dumps and transported to the 54 inch primary crusher. Rock chunks too big to pass the 4½-yd. dipper (about 1 chunk per 40 tons of crude ore) are reduced to handling size by a 4-ton drop ball handled by a truck crane.

Tournatractor—Trademark T-751-M-b

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Diamond mining in South West A

Huge fleet of modern machines moves millions of tons of earth yearly to get 400 pounds of precious stones

For every pound of diamonds recovered by Consolidated Diamond Mines of South West Africa, Ltd., 65 *million* pounds of sand, rock, gravel and gypsum have to be handled.

To move this tremendous volume of material, the company has chosen a fleet of 88 LeTourneau-Westinghouse self-powered electric-control scrapers, rear-dumps, and tractors. Only machines like these, equipped with big low-pressure rubber tires, have the necessary flotation to work in the soft, loose sand which covers Africa's diamond country. Despite this sand, despite high winds which alternately fill the air with sand or corrosive sea mist, despite heat and great distances, these machines are moving the enormous total of 885,000 cubic yards of overburden per month — more than 8½ *million tons* per year.

Prospecting done near ocean

Most of their work is done along a narrow 200-mile-long strip of land located 1 to 20 miles inland from the Atlantic Ocean. Here, the diamonds were washed up thousands of years ago. The passage of time, the receding water, the frequent storms, left the stones buried deep under desert sand. As the centuries passed, rock and gypsum were mixed with the sand and turned into 18 to 24-inch horizontal layers of "calcrete" — a strata much like man-made concrete.

Units dig long trenches

Searching for diamonds, so well-hidden under these tons of overburden, is a lengthy, tedious, difficult process. Five to 10 years before mining can begin,

After sand has been removed from a trench 10 to 15 ft. wide and 1500 to 1600 ft. long, prospectors examine diamond-bearing gravel by painstaking hand-operated pan and screen methods. An accurate record is kept of every cubic yard to determine whether a given area is rich enough to make mining profitable. If it is, a fleet of Tournapull Rear-Dumps, shovels, and draglines is moved in.

Hauling to processing plant or to dump, LeTourneau-Westinghouse Model D Rear-Dumps carry 7 cubic yards of sand and gravel per load. They complete typical 14,000-ft. cycles over sandy roads every 13 minutes. In spite of sandstorms and salty sea mists, the 36 original Rear-Dumps have maintained an average mechanical efficiency of 90% for more than 18 months (5,000 working hours each).

A Subsidiary of Westinghouse Air Brake Company

Africa

First step in South African diamond mining is to find an area rich enough to warrant development. In this exploratory phase, Tournatractors and Tournapull-Scrapers combine to remove 30 to 50′ of sand from the diamond-bearing gravel. Tournatractors push-load each Tournapull with 7 yds. in about 20 seconds. Pulls complete 400 to 500′ cycles every 1½ min. Each Tournatractor assists 3 Pulls in loading, accounts for about 100 loads per hour.

To reach mine site at Oranjemund, South West Africa, C.D.M.'s fleet of 42 Tournapull Rear-Dumps, 30 Tournapull-Scrapers, and 16 Tournatractors drove from Port Nolloth under their own power. The 65-mile trip took them 4 hours. Simple, fingertip control system proved so easy to learn that unskilled workmen operated well after a few hours of training.

All gravel goes through primary crushing and screening plants like this one. On the average, hundreds of loads of gravel must be processed for a handful of diamonds. Add this figure to the tons of overburden that must be moved before the diamond-bearing gravel is uncovered, and you can see why these gems are so precious and so costly. Last year, the plants here handled *17 billion pounds* of earth to produce less than *400 pounds of diamonds*. For each carat, they moved over 10 tons of earth.

prospectors move into a new territory. Consolidated Diamond Mines now uses a prospecting fleet of 24 Tournapull-Scrapers and 10 Tournatractors to clear large exploratory trenches through the sand and calcrete. These expose the layers of diamond-bearing gravel. When finished, the average trench measures 1600 feet long, 30 to 50 feet deep, and 10 to 15 feet wide. Into each of these trenches goes a crew of skilled prospectors. Using slow, hand-operated pan and screen methods, they analyze the gravel handful by handful. If the analysis proves rich enough, full scale mining begins!

A primary crushing and screening plant is then built. Shovels or draglines are brought in, and some of the company's 42 Tournapull Rear-Dumps are driven to the mining site. They go to work hauling tons of diamond-bearing gravel from shovel to plant, and tons of sand and calcrete overburden to dumps.

Tournatractor assignments include keeping waste water channels clear to the sea, push-loading scrapers, towing trailers, clearing stones from washing plant, and dozing diamond-bearing gravel to shovel for loading. Men on the job say Tournatractors, because of their special high-flotation low-pressure smooth-tread sand tires, can drive over soft sand where no other vehicle can pass.

Stripping increased by 91%

According to the General Manager of the mines, the LeTourneau-Westinghouse machines have greatly increased production and cut costs. One of his annual reports reads in part:

"The amount of overburden stripped has increased by 91% and the amount of diamond-bearing gravel treated has increased by 34%. This is due to the use of modern mechanical rubber-tired machines which arrived during the year."

Bigger output offsets higher labor costs

The Consulting Engineer's report adds: "The field cost per cubic yard mined is the same as in 1951. This indicates how effectively mechanization has offset increases in the cost of labor and stores."

14 units added to 74 originally at work

And here is further proof of Consolidated Diamond Mines' satisfaction with their LeTourneau-Westinghouse units. Performance was so good in the first 18 months that the company recently ordered and took delivery on 6 more Tournapull-Scrapers and 8 more Tournapull Rear-Dumps. This increased their huge LeTourneau-Westinghouse fleet to 88 machines!

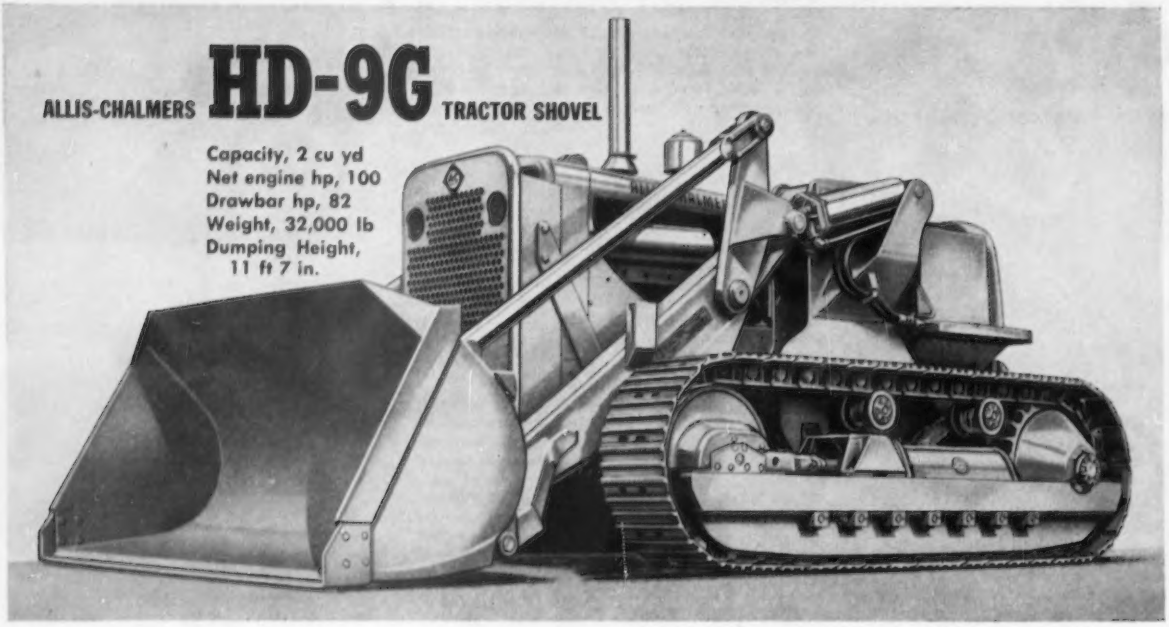
Diamond mining is highly specialized work. But the same features that make LeTourneau-Westinghouse equipment so efficient in the diamond fields will pay dividends in any type of earthmoving. Write direct to us, or see your Distributor for more information.

Tournapull—Trademark Reg. U.S. Pat. Off. Tournatractor—Trademark G-686-M-w

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

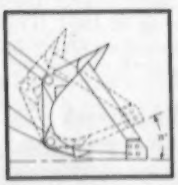


POPULAR 2-YD HD-9G TRACTOR SHOVEL NOW OFFERS

Higher Work Capacity

Design refinements in the Allis-Chalmers HD-9G now make it even more productive than ever. First, the net engine output has been increased to 100 hp, with 23,000 lb of push for extra crowding and digging ability, fast work cycles.

Streamlined bucket design now helps roll in large loads with less tractor effort. The back of the bucket has been brought forward and the sides extended to cut spillage, put more pay load where it's wanted. Cleaner dumping with the new bucket saves the operator time and effort shaking out loads.



A new addition to the wide variety of attachments available for the HD-9G Tractor Shovel is the Tip-Back bucket which allows the operator to roll the bucket back approximately 25° at ground level. Ideal for handling greater capacities of loose stockpiled materials, the Tip-Back bucket can be carried lower to the ground for greater stability . . . can load bulky objects easier.

New-type ceramic master clutch lining reduces lever pull, makes it easier for the operator to do more. The new HD-9G helps the operator do more in other ways, too — giving him full vision, fast and easy control, cleaner platform and more comfortable seat from which to work, and more working time with truck wheels, support rollers and idlers that need greasing only once every 1,000 hours.

Lower Operating Cost

Design improvements also add longer life to the HD-9G under all work conditions. Heavy box-section booms are 50 percent stronger, assuring proper alignment even working in the toughest materials. The low design of the new HD-9G combination stabilizer and cowl not only offers easy accessibility for maintenance and service, but contributes to maximum operator vision. New ceramic master clutch lining operates longer between adjustments, increases clutch life.

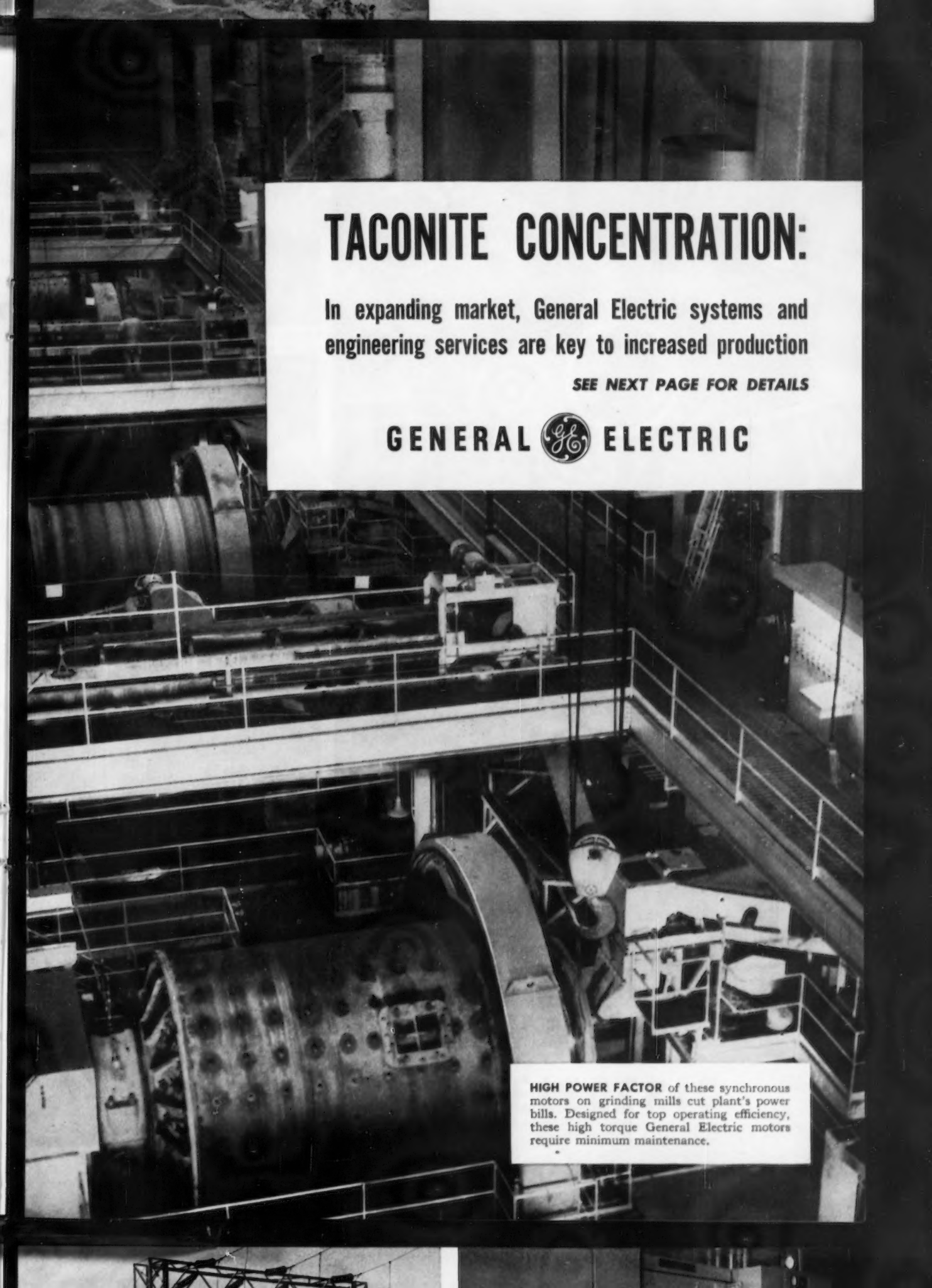
Hydraulic system provides new maintenance simplicity, safety of operation, as well as improved visibility. With new-style tank, there are few external fittings, greatly reducing possibility of outside leaks. Magnetic filters and suction-line screens protect the entire system from damaging grit. New, improved hydraulic pump is designed for long life as well as fast and accurate bucket action.

Heavy-duty truck wheels and idlers are available for particularly tough working conditions. One-piece, full-length main frame permits unit construction so that major assemblies can be removed without disturbing adjacent units, putting tractor back on the job in hours rather than days.

☆ ☆ ☆

See your Allis-Chalmers dealer for further information on what the HD-9G can do for you — or a demonstration right on your job.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.



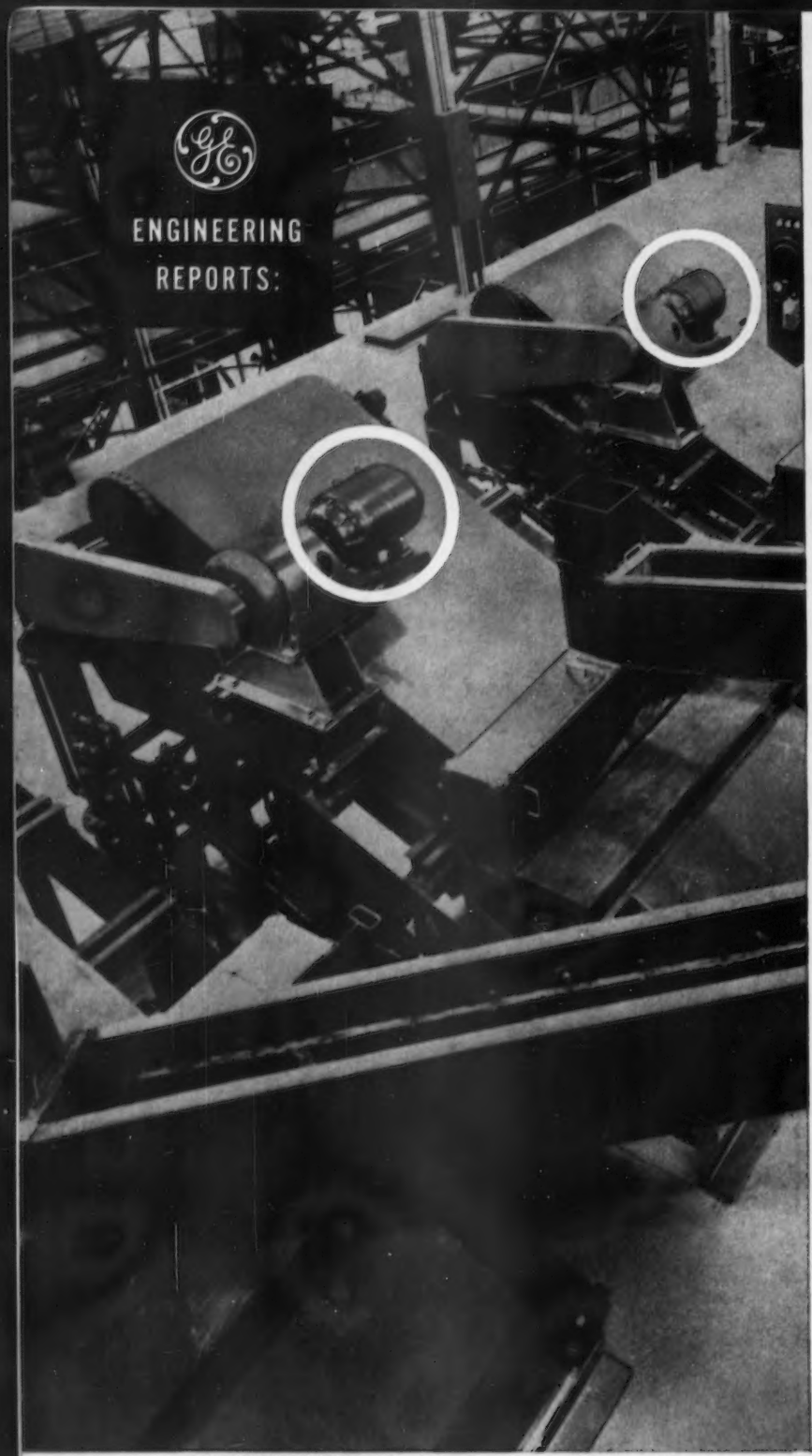
TACONITE CONCENTRATION:

In expanding market, General Electric systems and engineering services are key to increased production

SEE NEXT PAGE FOR DETAILS

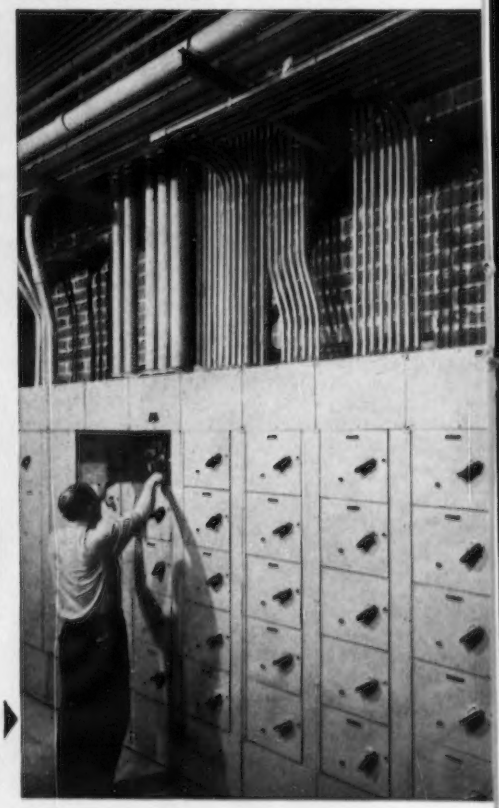
GENERAL ELECTRIC

HIGH POWER FACTOR of these synchronous motors on grinding mills cut plant's power bills. Designed for top operating efficiency, these high torque General Electric motors require minimum maintenance.



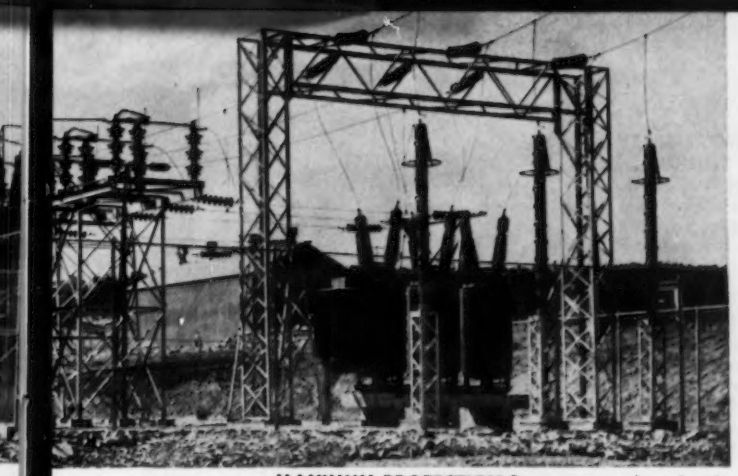
SPECIALLY-DESIGNED for taconite concentration service, rugged G-E Tri-Clad* motors have been fully tested in the taconite field. These totally enclosed, fan-cooled motors are built for long operating life and a minimum amount of maintenance.

EXPERIENCED G-E ENGINEERS save you time and money in the planning, delivery, and installation of your electrical system.

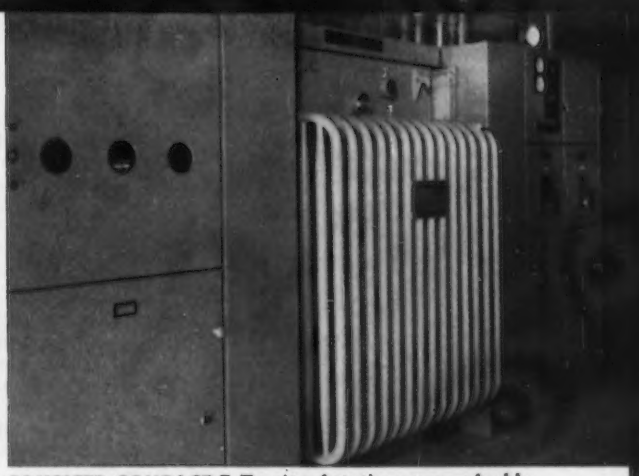


EASY-TO-INSTALL G-E Cabinetrol* control centers are delivered factory assembled. Located in ventilated control rooms, they give centralized control for plant operations.

*Reg. trade mark of General Electric Co.



MAXIMUM PROTECTION for concentration plant's distribution system is assured by G-E packaged substations. They are designed with standard components to meet individual requirements



COMPLETE, COMPACT G-E unit substations save valuable floor space. They provide power for round-the-clock operation of plants. Factory assembled, they are easy to install and can be expanded with ease.

G-E electrical systems and engineering services help

INCREASE TACONITE CONCENTRATE OUTPUT

Taconite concentration uses power, and lots of it. And, with the production of iron ore concentrates expected to increase 30 times by 1970, the importance of a flexible co-ordinated electrical system cannot be overlooked. For the key to top production in taconite concentrators is a co-ordinated electrical system which incorporates all electric equipment into a smoothly functioning unit. To help you plan your system, General Electric offers these engineering services.

APPLICATION ENGINEERING:
G-E Engineers, experienced in the taconite processing field, will work with you, or your consulting engineers. They will help design an electrical system to fit your individual needs today, which can be readily adapted in future expansions.

PROJECT CO-ORDINATION:
G. E. will co-ordinate selection, delivery and installation of all electric equipment to assure that the right equipment arrives at the right time.

FIELD ENGINEERING:
Field Engineers are available to assist with the installation and start-up of your electrical system.

PRODUCT ENGINEERING:
Extensive tests in taconite plants and research laboratories are conducted by G-E Product Engineers to assure that G-E electric equipment is designed to meet the rugged requirements of taconite service.

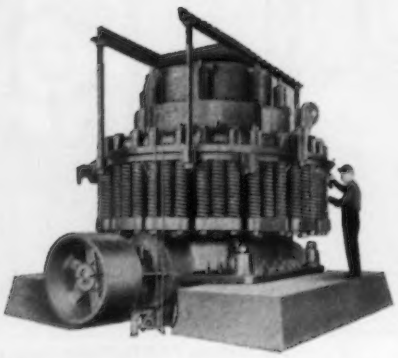
These G-E engineering services are designed to help you get the best electrical system for your particular needs. They will also save you time and money in the ordering, delivery, and installation of your electric equipment. For more information about G-E electrical systems and services, contact an Apparatus Sales Representative at your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 660-32

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC

SYMONS® PRIMARY GYRATORY CRUSHERS... Built in sizes from 30" to 72" feed openings to meet any desired production operation.

SYMONS CONE CRUSHERS... The machines that revolutionized crushing practice. Built in sizes from 22" to 7' diameter heads with a wide range of capacity.



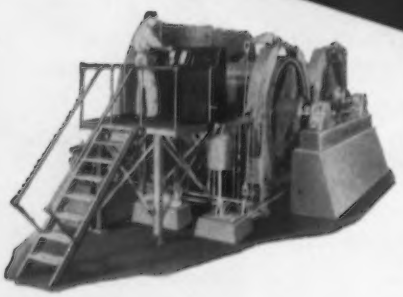
NORDBERG MACHINERY for the MINING INDUSTRY

For base metals...precious metals ...the rarer elements...non-metallics and minerals . . . NORDBERG MACHINERY is the outstanding choice of producers in the mining industry the world over.

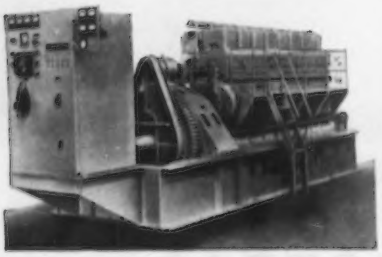
More than half a century of progressive engineering achievement, combined with quality production, in unexcelled manufacturing plants, have firmly established Nordberg's leading position in the field of heavy machinery design and construction.

Nordberg Machinery assures maximum and continuous production at low operating and maintenance cost. For full details, write for literature on the machinery you need.

NORDBERG MFG. CO.
Milwaukee, Wisconsin

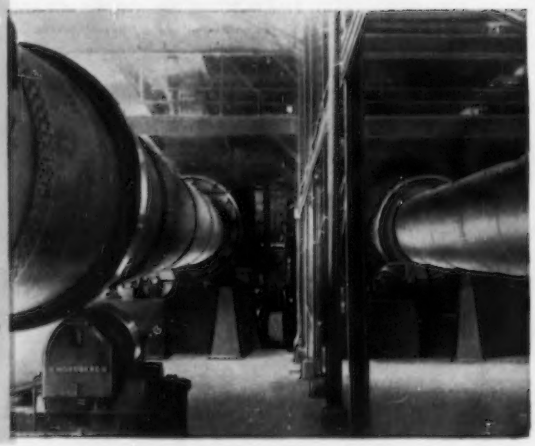


NORDBERG MINE HOISTS... As the source of the most progressive hoist engineering advances in the mining industry, Nordberg has held worldwide leadership in the hoist field since 1895.



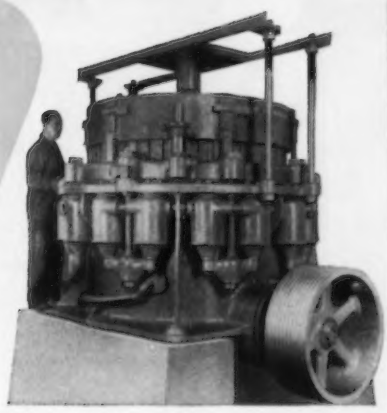
NORDBERG ENGINES . . . For oil, gas or Duafuel® operation. Built in sizes from 10 to over 10,000 horsepower to meet practically all power requirements.

NORDBERG KILNS — DRYERS and COOLERS... To meet a wide range of requirements, including pyro processing operations, drying, calcining burning and cooling.



NORDBERG GRINDING MILLS . . . Ball, tube, rod and compartment types for wet or dry, open or closed circuit operation.

SYMONS VIBRATING GRIZZLIES . . . Built in bar and rod types for effective heavy duty scalping service handling feed sizes up to 30" and larger.

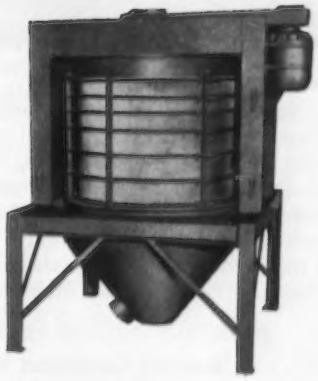


NORDBERG GYRADISC CRUSHER . . . A revolutionary machine for the production of large tonnages of extremely fine product.

SYMONS HORIZONTAL VIBRATING SCREENS . . . Level position assures extreme accuracy in sizing, requires less headroom, permits easy installation.

SYMONS ROD DECK SCREENS . . . Highly efficient screening surface of spring steel rods—easily replaced. Especially suited for wet, sticky materials.

SYMONS "V" SCREENS . . . For extremely fine, single cut wet or dry separations. Employs controlled diffused feed and vertical flow of material.



© 1955, Nordberg Mfg. Co.

M155

NORDBERG MACHINERY

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

SYMONS . . .

A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

Protection Under ALL CONDITIONS of Grinding Operation

Protection requirements vary. That's why Allis-Chalmers control is recommended and applied with expert, personal attention to the specific problem at hand. For example, the starter illustrated is custom-engineered to control a 1000-hp, 2300-volt synchronous motor driving a ball mill. Its protection features not only meet regular operating requirements but also handle unusual emergency conditions. These features include:

- **Current-Limiting Fuses**
- **Thermal Overload Relays**
- **Squirrel-Cage Protective Relay**
- **Time-Delay Undervoltage Relay**
- **Polarized Field Application Relay**

For complete information, see your A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4703

Optional Features:

Exciter voltage relay to prevent starting when excitation voltage is not available; dc field failure relay to shut down motor on field current failure; instantaneous phase reversal and open phase; inching control for positioning mill.

A-C ALLIS-CHALMERS

When you're CORE-DRILLING, it's no gamble with these 3 aces in the hole

JOY Diamond Core Drills When these three "aces" go into the holes, luck no longer is a factor. They are a sure bet to tell you exactly what is down there. And, at Joy, you can find the right "ace" to do the best job for you.

With maximum capacities ranging from 500 to 2000 feet, there are Joy diamond drills applicable to almost any coring job. And they'll do the best job for you. Here's why . . .

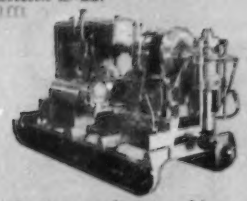
EXTREME PORTABILITY Skid mountings, compact design, and rugged construction make it possible to drag Joy diamond drills into some of the most inaccessible locations.

VERSATILITY Because they are available with either hydraulic or screw-feed swivelheads and with a choice of gasoline, electric or air power, Joy core drills can fit into any drilling program without expensive preparations.

Check your drilling needs against this group of outstanding drills. One of them will be suitable to your needs and it will do an accurate, economical job of proving the mineral value of your property. Write today for literature on the machine you need to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

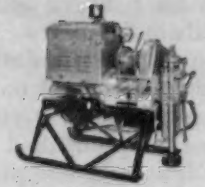
***22-HD** The rugged, heavy-duty model. Capacity—2000' with EX fittings. Also available as truck-mounted drill or on twin-column mount for underground operation. Bulletin D-28.*

1



***12-B** Extremely portable, weighs approximately 1200 lbs. Capacity—1000' with EX fittings. Also available on twin-column mount with air motor drive for underground operation. Bulletin D-21.*

2



***No. 7** The lightweight, easily transportable model. Can be taken underground or transported by airplane, boat, or even muleback into remote areas. Capacity—500' with EX fittings. Bulletin D-24.*

3

CONTRACT CORE DRILLING *Sub-surface test borings for mineral prospecting, foundation drilling, and grout hole drilling are available on a contract basis. Highly skilled crews and complete stock of core drills, bits, and accessory equipment are maintained at all times.*

Consult a Joy Engineer

W&D M2508

JOY

WORLD'S LARGEST MANUFACTURER OF CORE DRILLS AND MOTORIZED DRILL RIGS SINCE 1851

The GISMO offers you an entirely NEW concept of simplicity and economy in mining...

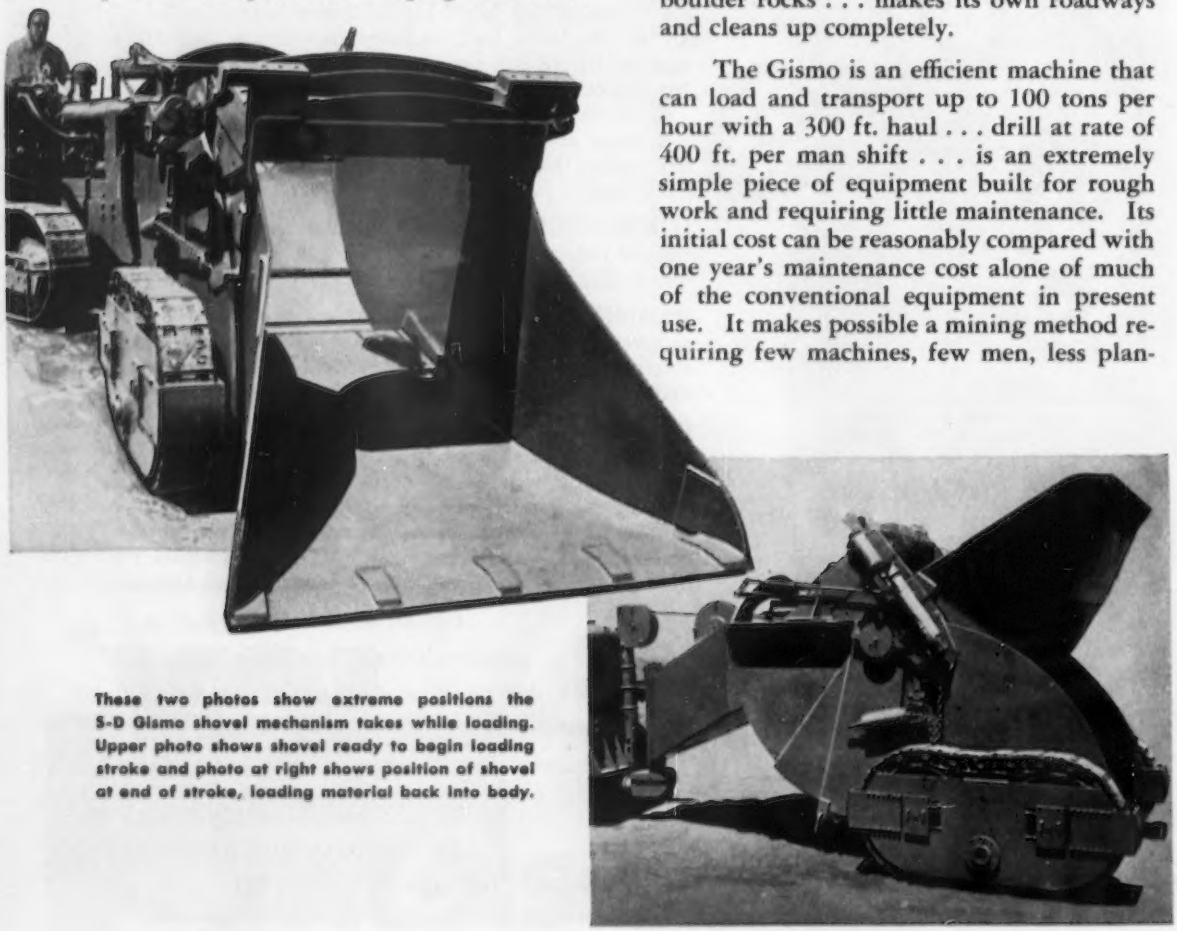
THE GISMO offers you a new method of mining. One that over a period of 2½ years of intensive development in actual work has proved beyond question advantages that merit its thorough investigation by any firm excavating rock or its equivalent.

The Gismo offers you a general purpose utility self-loading transport that is simple, versatile and built to take the brutal punishment of rock excavation—and at important savings! It is well suited to almost all mining conditions. No special development facilities or conditions are usually required. It operates in sloping ore bodies with irregular outlines, as well as large or relatively small openings. The Gismo is easily maneuverable at maximum or minimum speed of the equipment.

With perhaps a few exceptions, the Gismo can be taken into any mine. Its cross sectional dimensions are small compared with other equipment. It can be dis-assembled for lowering through small shafts.

Its versatility meets every requirement. It loads (mucks) in development or production . . . transports . . . drills (supports 2 to 5 jib mounted drills) . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely.

The Gismo is an efficient machine that can load and transport up to 100 tons per hour with a 300 ft. haul . . . drill at rate of 400 ft. per man shift . . . is an extremely simple piece of equipment built for rough work and requiring little maintenance. Its initial cost can be reasonably compared with one year's maintenance cost alone of much of the conventional equipment in present use. It makes possible a mining method requiring few machines, few men, less plan-



These two photos show extreme positions the S-D Gismo shovel mechanism takes while loading. Upper photo shows shovel ready to begin loading stroke and photo at right shows position of shovel at end of stroke, loading material back into body.

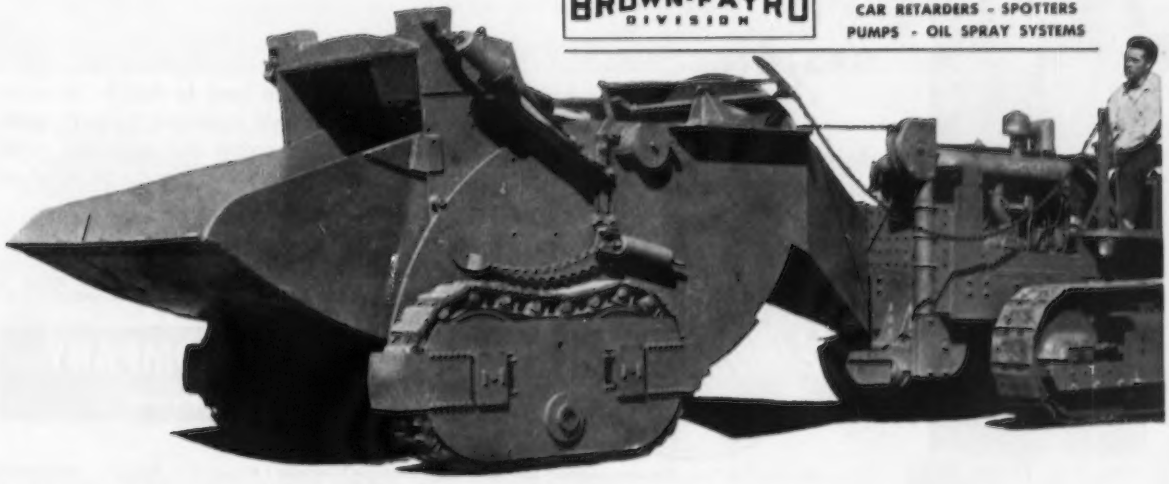
ning and integration. It allows total mechanization of your mine—the solution to present economic conditions of high man-hour and materials cost, and low metal prices. Contact us for complete information. *Sanford-Day Iron Works, Inc., P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee.*

The Gismo does not load by momentum or crash fashion! As it approaches the foot of muck pile, shovel head is eased into pile as simply as a hand shovel into sand. Material is actually shovelled under complete control of operator and within his complete vision. Photo at bottom of page shows Gismo with tractor, operated by only one man.

Sanford-Day
IRON WORKS
KNOXVILLE • TENNESSEE

AND
BROWN-FAYRO
DIVISION

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS
CAR RETARDERS - SPOTTERS
PUMPS - OIL SPRAY SYSTEMS



Clarence Thom

Henry J. Gisler

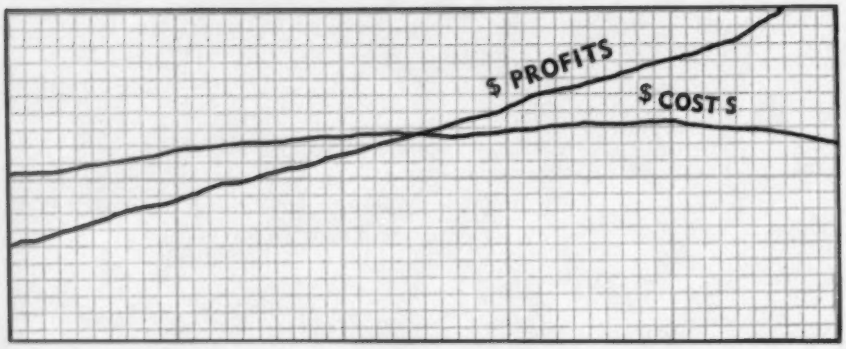
Leland Logue

Clifford F. Page

Frank A. Seeton

Henry C. Hurd, Jr.

Let These DECO Engineers Help You . . .



Have you or your engineers consulted us?

These DECO Engineers with their many years of field, operating, design and laboratory experience can help you INCREASE PROFITS and LOWER COSTS.

LONG EXPERIENCE

There is no substitute for long and varied experience. Our engineers are here to help you. Use their ability by submitting your problems to us. This consulting service is at no cost to you.

ORE TESTING

Send us a small sample by parcel post (10 to 15 pounds is usually sufficient). We will make a preliminary examination at no charge and give you a report on these preliminary findings. These reports supply facts for your future plans. DECO recommendations are accurate, unbiased and thorough. They are based on sound engineering and economic principles and will greatly accelerate the success of your project.

FLOWSHEETS

DECO Engineers will help you work out the flowsheet which will give you an operation that is simple, efficient and most profitable. Many typical flowsheets are at your disposal and may apply to your specific problem.

DESIGN

Your plant can best be designed by men who have been in that business for many years. After our many years of mill design and operation we have available for use, typical mill designs and mill construction and operating costs. Machine templates will aid you in your layout work. Please write to us about your contemplated plans.

Complete batch and pilot plant testing facilities are available.

"The firm that makes its friends happier, healthier and wealthier"

DECO FLOTATION ENGINEERS — DENVER EQUIPMENT COMPANY 24 HOUR SERVICE

DENVER EQUIPMENT COMPANY

• 1400 17th Street • Denver 17, Colorado

Denver • New York • Chicago • El Paso • Salt Lake City • Toronto • Vancouver • Mexico, D.F. • London • Johannesburg

Wire Rope at Work—Installed at an Eastern bituminous mine, these big wire ropes lift nine-ton skips up a two-compartment vertical shaft. The skips are loaded approximately 500 ft below the surface, then hoisted in 40 seconds to the dumping point in the headframe. All in all, the hoist accounts for approximately 600 trips per day, lifting more than 5,000 tons of run-o'-mine coal.

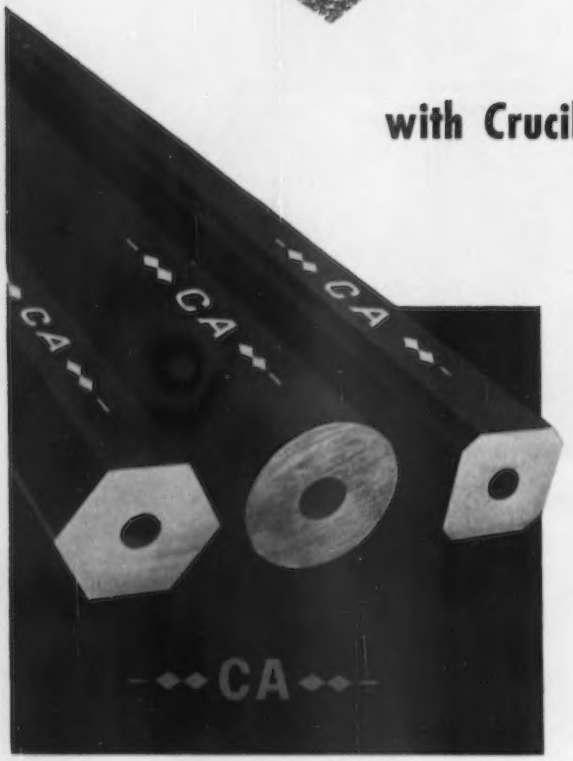
In a schedule like this, involving almost constant operation, there is little leisure time for the ropes. The busy cables need strength, stamina, high resistance to bending fatigue. To insure top performance, the management long ago standardized on Bethlehem Purple Strand, and regularly specifies 1¼-in. 6x25W. The ropes are always Form-Set (preformed), and lang lay has been found most suitable.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • CONSTRUCTION • PETROLEUM • EXCAVATING • QUARRYING • LOGGING • MANUFACTURING

Now! 300% more hole at 60% less cost...



with Crucible CA DOUBLE DIAMOND alloy hollow drill rods

That's the phenomenal results construction men are getting with Crucible's new CA DOUBLE DIAMOND alloy hollow drill rods.

These new rods actually have *three times* the drilling life of ordinary carbon rods. On one major construction job CA DOUBLE DIAMOND alloy rods averaged *630 feet per rod*. And, although they are slightly higher in price, these longer-lasting rods cut costs by 60%.

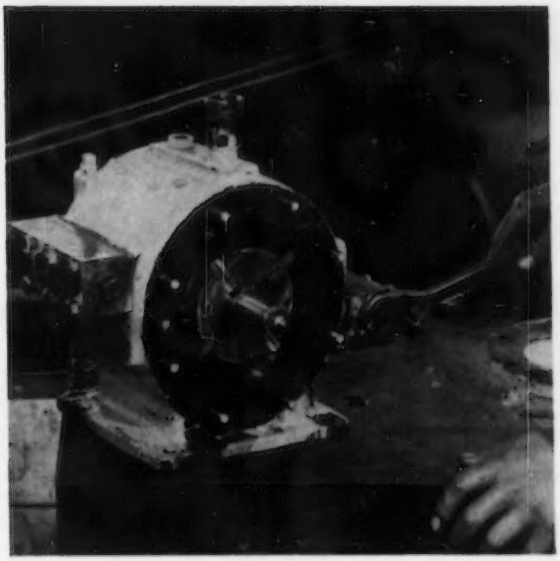
It's the *steel* that makes the difference. For CA DOUBLE DIAMOND is a tough, high-carbon, high-chromium *alloy* steel, *prescription-made* for maximum resistance to wear and abrasion. What's more, its hardness in the natural or as-rolled condition is substantially higher than carbon rods. You get a stronger rod with higher fatigue resistance.

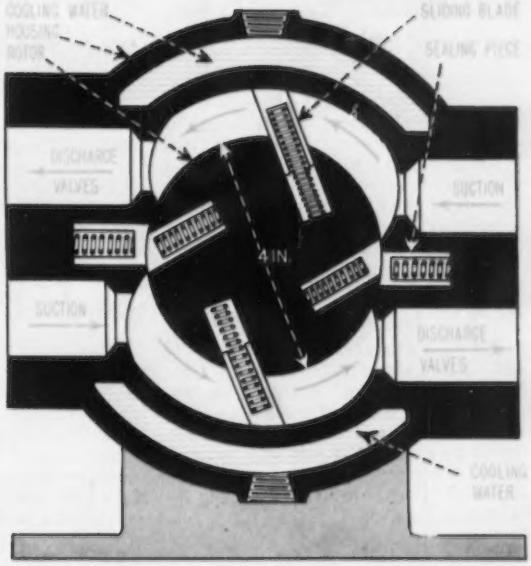
With CA DOUBLE DIAMOND, as with any alloy steel, special heat treating methods give the best results. And they'll pay off in longer rod life . . . lower drilling costs. Crucible will be glad to supply full information on CA DOUBLE DIAMOND alloy rods . . . or on its many other alloy steels for construction applications. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST





A NUMBER OF CURVES WERE BLENDED in designing the chamber of this unusual compressor. The compound curve produces a rapid increase in pressure as the sliding vanes near the discharge valves. At the same time it allows the spring loaded vanes to maintain a perfect seal. No lubricant is needed and either air or water can be used for cooling.

Novel, Compact Compressor In Production (1)

A novel compressor, ⅓-⅔ smaller and ⅓ cheaper than conventional models with comparable output, is coming off a San Francisco production line after two years of test runs.

Petersen Enterprises' current model has a capacity of 120 cfm and a discharge pressure of 120 psi. Dimensions of the 130 lb prototype are 11 x 9 x 9-in.; inside bore is 6 in.; rotor dia. 4 in. Other models are being designed with 6-in. to 18-in. bore dia. for an output range from 30 to 350 cfm, and will be produced as demand arises.

It is possible for the unit to develop high output at relatively low rotational speeds because it has two independent compressors off a single concentrically-mounted shaft in one housing. Both compressors are served by the same rotor and the same reciprocating blades.

According to the inventor, Hans M. Petersen, the shape of the chamber curve leading to the discharge valves is of utmost importance in producing very rapid acceleration in pressure, as the air trapped between the vanes is nearing the discharge valves. In the design, five curves were blended into one to get the proper shape. The result is a curve which the sliding vanes will follow at high speed, keeping a perfect seal against the inner wall of the housing. Vanes are spring loaded for good chamber contact.

Because it operates without lubricating oil, the compressor should operate well in extreme cold, since there is no oil to congeal. Sliding blades and bearings are made of an oil impregnated, iron-copper alloy, eliminating the conventional oil separator found in lubricated sliding vane compressors. The porous alloy, super Oilite, is made by the Amplex division of Chrysler Corp. The material is 75% iron and 25% copper compressed into briquettes, which are soaked in acid, then in oil for about 25% saturation. Life tests on the unit indicate capillary action does not bleed the lubricant or contaminate the air.

Elimination of the chamber lubrication system and oil separator, combined with small size and weight, will make it possible to sell the compressor for about ⅓ less than competitive models. Since there are only four moving parts, and wear has proved negligible in tests, maintenance and parts-replacement costs also are expected to be low.

Air or water can be used as a coolant.

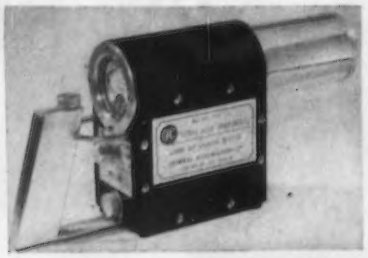
The compressor can be driven by any conventional standard gasoline engine or electric motor. Petersen is designing a miniature sliding vane gasoline engine of the same size as the compressor, with many parts interchangeable. It will have direct injection, magneto ignition. The compressor, combined with the new motor, will have overall dimensions of 24 x 9 x 9 in., and weigh about 500 lb, complete.

Principal immediate market for the compressor will be for units to power air hammers. The designer says it can be built in any size for any purpose. The unit is expected to be in demand for use in remote regions where portability is important.

Union Machine Co., San Francisco, will manufacture the compressors, with initial production set for 20 a day. Patents are pending in the U.S. and have been granted in Australia to Petersen Enterprises, San Francisco.

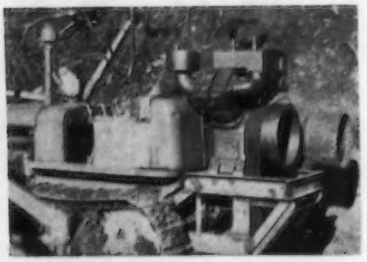
PORTABLE ROCK DRILL (98)

Called the "Pionjär," this 86-lb percussion type rock drill is powered by an integral gasoline engine. It develops enough air to blow out the cuttings from holes at least 13 ft deep. Forty-five degree up holes as well as down holes can be drilled. Made by Svenska Motorborr, it has drilled medium hard granite at 10 in. a minute with a 1.34 in. TC bit.



WATERPROOF COUNTER (2)

The "Scintillator Transducer, Model 711" will operate fully submerged under water, according to General Automation Co., Los Angeles, Calif. This quality, as well as its design for rugged use in altitude and temperature extremes make it noteworthy. Subminiature sockets and vacuum tubes, standard radio shop items, make field replacement possible.



AIR COMPRESSOR (3)

One of a line recently offered by Copco Pacific, this CT 4 compressor is mounted on an Allis-Chalmers HD 7 to handle 2 rock drills and a pneumatic boom. It is driven by a standard power take off arrangement. The air cooled piston type machine is rated for 185 cfm at 100 psi. Not offered mounted, this is a field application.

NON-OILY PENETRANT (4)

For loosening corroded nuts or bolts and larger siezed-parts of mechanical equipment, "Puritan" penetrant is reported to be more effective than oils. Non-flammable and odorless it does not spread over work. Yet it is deep and fast acting. A development of Olin Mathieson Chemical Corp., it is distributed by NAPA jobbers.

ROTARY COMPRESSOR (5)

Production of a 600 cfm wagon mounted rotary air compressor has just been announced by Gardner-Denver. The advantages of a rotary type—light weight, compactness and simplicity—are combined with the weather defying advantages of water cooling. It is powered by a GM diesel engine, weighs 8700 lb, is called the Rotary 600.

OIL FILTER (6)

Now available for heavier engines such as trucks, tractors and industrial engines, the "Improved-Lifetime" oil filter consists of a cylindrical shell of millions of tiny bronze spheres fused together where they touch. Originally developed for autos, it never needs replacing, according to Engine Products Mfg. Co., restored like new by cleaning.

CAR SHAKER (7)

Simplicity Engineering Co. has announced the manufacture of a new car shaker. It is designed to fit any size drop bottom gondola. A gyrating mechanism vibrates the car for rapid discharge of granular material even when frozen. The release says it reduces the old manual method involving several man hours to one man and a few minutes.

ELECTRIC GENERATOR (8)

A new line of small air cooled, gasoline-engine driven, electric generators are being produced by Onan & Sons. They have outputs from 500 to 2500 watts ac. Dc battery charging units are also available in most sizes. High output per pound of weight makes them especially suitable for mobile and portable applications.

DIAPHRAGM PUMP (9)

Two 4 in. units are combined in a diaphragm pump lately introduced by Rice Pump & Machine Co. It is a light weight, trailer type, powered with a gasoline engine. It can handle up to 25-ft heads, is self-priming, and can handle water with a high percentage of mud or sand. Other models are available for electric drivers.

STRONGER WIRE ROPE (10)

Latest producer of a new grade of wire rope is American Chain and Cable Co. A wartime development already widely tested, it is known as VHS, is 15% stronger than improved plow steel and contains an independent wire core. The wear resistant qualities make it especially adapted to rough usage—slushers, earthmovers, et al.

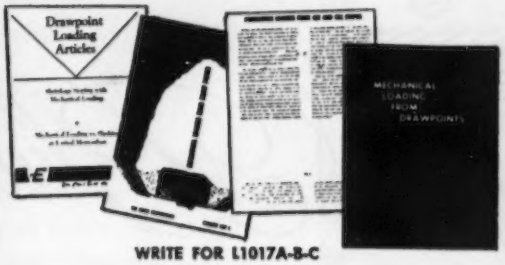
SMALL TORQUE CONVERTOR (11)

"Fluomatic" is reputed by the manufacturer to be the world's first torque multiplier for gasoline or electric motors under 10 hp. Being a starting or stopping shock eliminator, almost any such condition is an ideal application for the device. It is made by Little Beaver Industries, Willoughby, Ohio. A compact unit, it weighs 27½ lb.

ANTI-STICKING COATING (12)

"Teflon" coatings, bonded directly to equipment, will solve many problems of handling sticky materials or those that tend to leave undesirable deposits. A primer and finish coat are fused at about 700 deg F after being applied by spray. The Electro Chemical Engrg. & Mfg. Co. says a great variety of applications of the duPont product have proved successful.

PRODUCTION LOADING WITH EIMCOS WILL SAVE YOU MONEY



WRITE FOR L1017A-B-C

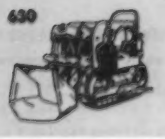
THESE BULLETINS WILL TELL YOU HOW AND WHY

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Baltimore, Md. Pittsburgh, Pa. Pasadena, Calif. Houston, Texas London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-101



ROEBLING ANNOUNCES ITS NEW

Royal 1105 Blue

WIRE ROPE . . . 15% STRONGER THAN YESTERDAY'S GUARANTEED STRONGEST!

15% MORE STRENGTH is a whopping improvement. But translate that extra strength into terms of increased service life and you've really got something to brag about.

★ What's more, Roebling is pulling no punches on the variety of this new rope that will soon be available. You'll be able to get **ROYAL BLUE** Wire Rope in EVERY DIAMETER from ¼" to 3½"... in EVERY STANDARD CONSTRUCTION with an independent wire rope core.

★ In addition to new high strength, Roebling type 1105 wire – the finest high carbon rope wire ever produced – gives **ROYAL BLUE** Wire Rope amazing toughness and resistance to impact, crushing, abrasion and fatigue.

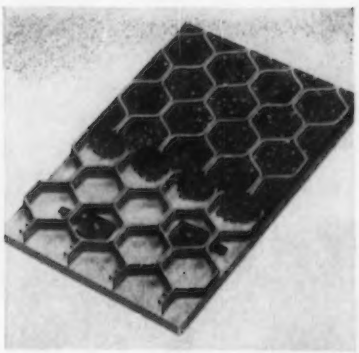
★ As the first step toward completely new service economy, write us for the whole story on **ROYAL BLUE** Wire Rope, or contact your distributor or nearest Roebling branch office.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 81 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

CFI



ANOTHER BABY

"The most durable floor ever designed for abnormal wear and rough usage" is what Klemp Metal Grating Corp., Chicago 38, Ill., believes they have created in Baby Hexteel their latest surface armor. Only ⅜ in. high, it is made in panels that easily lock together. It can be used on new concrete floors or filled with hot or cold mastic for resurfacing any floor. It has less weight per square foot and greater exposed steel surface than before. **(26)**

HAND DRILL

A solid head carbide-tipped hand drill is an inexpensive, highly portable means of digging test pits or running small exploratory tunnels for initial work on remote ore occurrences. Comes in two standard lengths of 18 and 24 in. and for hole sizes of 1¼-in. and 1⅛-in. Prices are $9.00 each for either size. Kennametal, Inc. **(27)**

GRIDDED MAGNIFIER

A measuring, 6-power pocket magnifier put out by Edmund Scientific Corp., Barrington 7, N.J., has an easily removed, gridded "geological" reticle. Another interchangeable "comparator" reticle is available for angular and linear measurements. **(28)**

VALVES

Grooved end valve, developed by Lunkenheimer Co., Cincinnati, Ohio, is designed for use with all types of standard grooved couplings. Its extremely close tolerances assure a perfect fit. Resulting connection is rapidly installed and leak proof, yet flexible enough to allow deflections of several degrees in any direction. **(29)**

DIAPHRAGM VALVE

The first such application of rigid Koroseal makes B. F. Goodrich feel that they make a diaphragm valve better able to withstand severe usage. This type valve consists of a flexible diaphragm actuated to press against a specially designed valve bottom. Advantages are smooth flow, tight seal, and elimination of packing—stem sealed off by diaphragm. **(30)**

SIPHONS

Camac acid proof plastic jet siphons empty waste acid from tanks and sumps. Plastic is fiberglass-reinforced Furacam which is not attacked by acid or alkaline solutions except strong chromic or nitric acid. Nozzles are sized for standard acid hose and the unit is easily disassembled for cleaning. Two sizes are available: 1200 gph and 4000 gph with 20 lb steam. Operation is possible with steam from 10 psi to 50 psi. Carl Buck & Associates, Essex Fells, N. J. **(31)**

WITH HANDLE ATTACHED

A light weight rail bond clamp for rail up to 100 lb is available from Ohio Brass Co., Mansfield, Ohio. A cup pointed set screw bites through rust and scale. The set screw has a swivel-action handle permanently attached. **(32)**

SOUND PROTECTOR

More effective, more sanitary, and more comfortable than earplugs are the claims for AO Straightway sound protectors which muffle the ears and adjacent bony structure with a snug fitting, soft vinyl-foam pad. Voices are still heard, but loud, high-pitched noise is not. A boost to morale and safety, they are made by American Optical Co., Safety Products Div., Southbridge, Miss. **(33)**

PEN-SIZE MICROSCOPE

Fifty-power magnification is provided in the new measuring microscope, now marketed by the International Development Co., East Riverton, N. J., enabling fast on-the-spot measurements to .001 inch. Shorter than the ordinary fountain pen, this rugged, light-weight INDECO microscope is simple to operate. Price is $7.95 postpaid. **(34)**

CUTS MILDEW

Superseal does it to fire hoses—cuts mildew. B. F. Goodrich Co., Industrial Products Div., Akron Ohio, developed the safety promoting material which makes the canvas jacket water-repellant. Keeping the hose from getting water soaked makes for easier handling both by reducing weight under normal conditions and increasing flexibility in freezing weather. It is said to feel drier than other gummy agents. **(35)**

Super Scale
for
Conveyors
Builders Conveyoflo is unsurpassed for accurate weight-metering of belt conveyor flows. Pneumatic system gives full-range metering with minimum vertical belt deflexion. Compact — no overhead framework or complicated lever arms. For Bulletin 550-H4A, write Builders-Providence, Inc., 391 Harris Avenue, Providence 1, Rhode Island.
BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS
FEEDERS
CONTROLS

SHEET METAL SHEAR (13)

A low cost rotary shear called the "Toolmaster" has been introduced by Fidelity Tool Supply. Hand operated, it can precision trim up to 2 in. from as much as 16 gage steel.

RESUSCITATOR (14)

England has produced another noteworthy apparatus, the "Eaton Rocking" resuscitator. Small in size and readily portable, only 22 lb, it is designed for correct administration of the "Eve" method of artificial respiration. It rhythmically rocks the victim through a definite arc, providing ventilation, circulation and warmth.

WATER RECEIVER (15)

Elimination of ordinary tanks and extra pumps is the purpose for which Moore & Siegal, Shullsburg, Wis., developed their "Pitless Water Receiver" for use with submersible pumps. A small cylindrical steel pressure tank mounted in the drill hole below the collar, is filled by the pump. The contained air, compressed to any desired setting, is the motive force for distribution.

LOADING SHOVEL (16)

Taking advantage of the straight-line loading principle, the "Merton" overloader is said to be a fast working machine. Seaboard Equipment Co. has been made U.S. sales representative for the English maker. It has a ¾ yd bucket rolling on rails, operated by cable winches, powered by diesel. Loading cycle takes 15 to 20 sec. Dumping height is adjustable.

ELECTRONIC ELEMENTS (17)

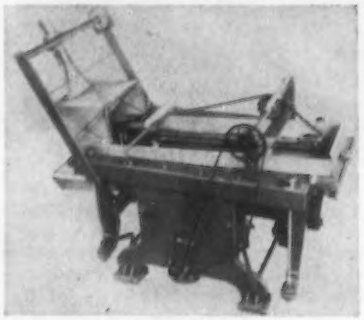
"Magnistors" by Potter Instrument Co. are a brand new rival to electronic tubes, transistors, and magnetic cores. Applicable to automation controls and computers, many advantages are claimed.

OINTMENT TUBE DISPENSER (18)

A squeeze of thumb and forefinger dispenses small amounts of ointment from tubes placed in the wall device. Prevents messiness, saves time and ointment. By Hygiene Research Inc.

PROCESS CONTROLLER (19)

An instrument for time control of two variables, can actuate up to 8 machines in any combination by use of two cams cut to desired shape, is available from the Bristol Company.



DEWATERING SCREEN (20)

Application of controlled gyratory vibration to dewatering screens resulted in the development of the "Russell" separator. Made in England by Russell Constructions Ltd., it is an outgrowth of their wartime work on sieving hazardous compounds. Claimed to handle very high rate of throughput, it is only about 6x3x3 ft in size.

METAL-FLAW DETECTOR (21)

"SempuN" is a magnetic device which uses iron oxide powder or ink as a surface spray to detect subsurface as well as surface flaws on metallic equipment. The English product is available from Rice-Peterson Sales Inc., Palo Alto, Calif. Forks on lift trucks, hooks on cranes, welds of all kinds are some applications which an imposing list of users have made.

CAB-OVER-ENGINE TRUCK (22)

A cab that power lifts vertically from the chassis makes the Mack Truck "Verti Lift D" series of trucks and truck tractors a radically new design. It cuts shop space needs, eases servicing.

STRAPPING TAPE (23)

Heavy duty packaging, e.g., strapping, bundling, palletizing, has a boon in "Black Wizard" super strength filament tape, states the maker, Vernon Chemical & Mfg. Corp. Continuous strands of synthetic fiber give it a tensile strength of 220 lb per in. width. Adhesive backed, it is impossible to tear, yet won't cut handlers.

TC BIT GRINDER (24)

Bitco Inc., Spokane, announces manufacture of fixtures for grinding carbide insert rock bits. Average bit dressing requirements are met by a mounting on any standard high speed, ¾-hp, heavy duty bench grinder. The company says it also can send the complete grinder-fixture combination, mount it on a larger machine, or send it to you for your own mounting.

CRAWLER TRACTOR (25)

Allis-Chalmers says the biggest and most powerful crawler tractor ever put into production, the HD 21, is now coming off the line. Their so-called torque convertor-engine-transmission team is reputed to give an outstanding performance. The machine is really heavy equipment at its biggest—44,000 lb developing 204 hp at the flywheel. It boasts a host of other new features too.

TRUCO CORING BIT

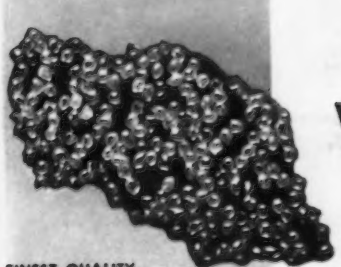
TRUCO CONCAVE BLAST HOLE BIT

TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS

TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

"Smash the Great Diamond, Before My Eyes!"

Vasilica was undoubtedly one of the most beautiful women in the whole world. Ali Pasha, Khedive of Egypt, was sure of it, and for such a treasure, what gift more fitting than this great diamond!

Treasured for centuries by Indian princes, it had been presented to Lord Piggott when he was Governor of Madras. When he died in 1770, it had been sold for $50,000 to a London pawnbroker who organized a lottery for the "Great Piggott Diamond" and saw it won by a poor clerk who quickly sold it and disappeared.

Recut to dazzling brilliance, it was presently offered to Ali Pasha who happily paid $150,000 for it and said, "Now, I have *two* great treasures—Vasilica and the great diamond."

But, Ali Pasha also had a deadly enemy, Raschid Pasha, who hated him and coveted his treasures and whose trained assassins awaited—and struck.

Realizing that his beloved treasures might now fall to his enemy, Ali gave one last command: "Smash the great diamond—before my eyes, and my dear wife, let her be strangled." But, while the slave was hammering the jewel to dust, Vasilica quietly slipped away and escaped.

Diamonds have played many such dramatic parts in the pageant of history but, today, one of their greatest roles is that of the vital cutting element in Truco Diamond Bits. Trucos have that irresistible cutting power which takes them through any formation swiftly, accurately, thriftily, dependably. They are used profitably in every phase of drilling. Have you the Truco Diamond Bit Catalog?

TRUCO DIAMOND BITS

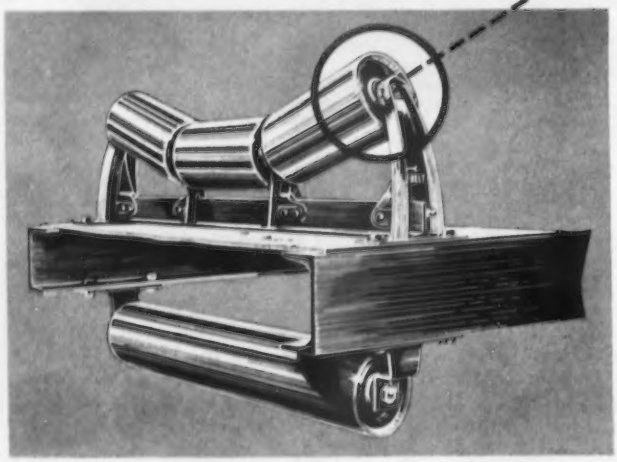
by

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

For longer idler life . . . here's 3-WAY protection in ONE simple, compact cartridge seal



THE effectiveness of Link-Belt cartridge grease seals in protecting belt conveyor idler bearings is matched by no other in industry. Besides the normal high efficiency of Link-Belt's labyrinth and contact seals . . . grease within the labyrinth further prevents entry of dirt or other particles. This cartridge (see above cutaway) is one integral unit—no springs, no loose washers . . . no possibility of metal-to-metal contact. From shaft to shell—bearings, fittings, rolls, frames, even hex nuts are designed for long, trouble-free life.

Also important, you can always find the *right* idler in industry's most comprehensive line—over 500 idlers in 34 types, built in a broad range of roll diameters and belt widths with matching return idlers. Ask your Link-Belt sales representative or authorized stock-carrying distributor for 48-page Book 2416, which covers this broad line thoroughly.

LINK-BELT

BELT CONVEYOR IDLERS

LINK-BELT'S superior grease seal is standard throughout industry's most comprehensive idler line

Series 100 Idlers
Continuous service for all but heaviest and coarsest materials.

Series 200 Idlers
Continuous service for heaviest and coarsest materials.

Series 400 Idlers
Continuous service for maximum volume per lineal foot of belt.

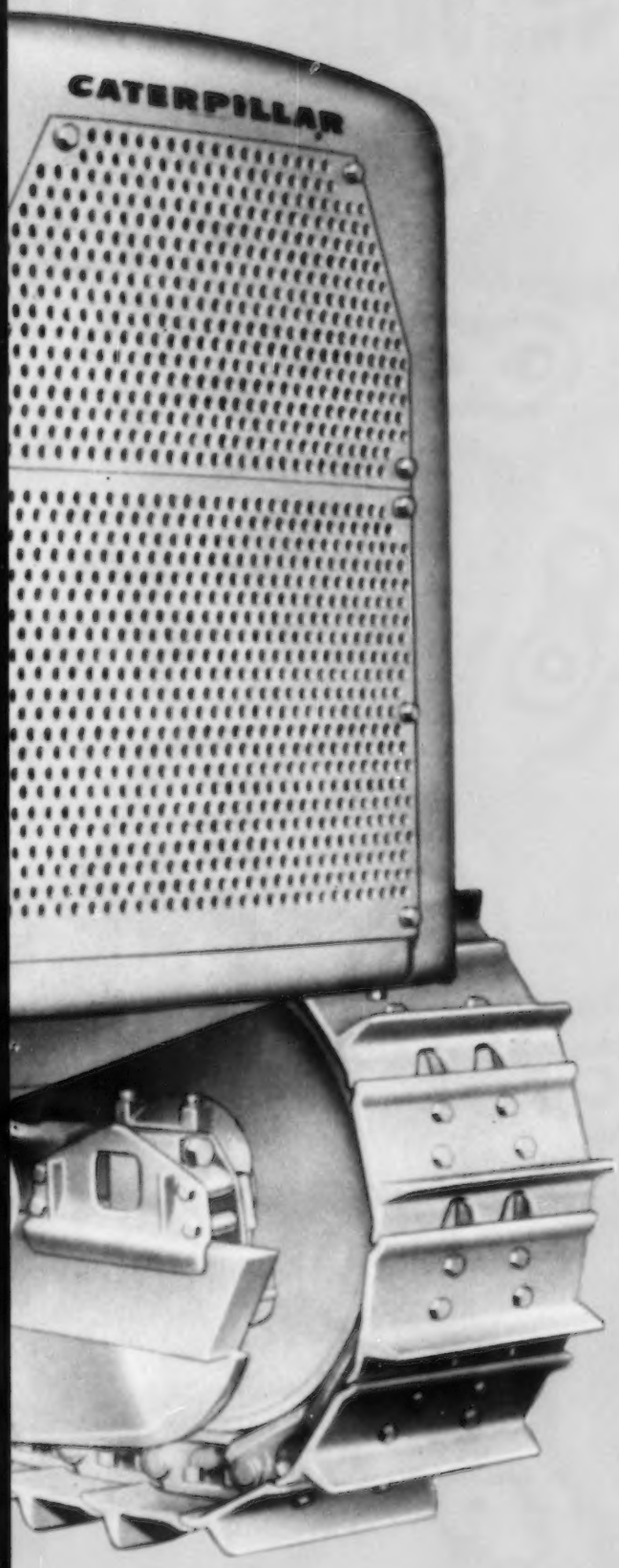
Series 500 Idlers
For greater volume than series 100 at maximum economy.

Series 600 Idlers
For grain and similar materials requiring only light belts.

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

12,856

DRILL BORTZ



IT'S HERE ➧

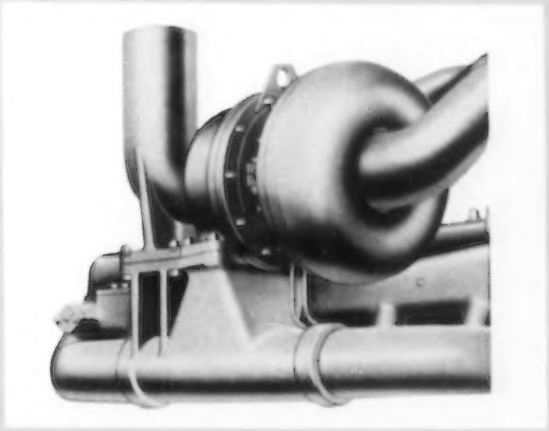
CATERPILLAR ANNOUNCES THE

D9

230 HP
(DRAWBAR)

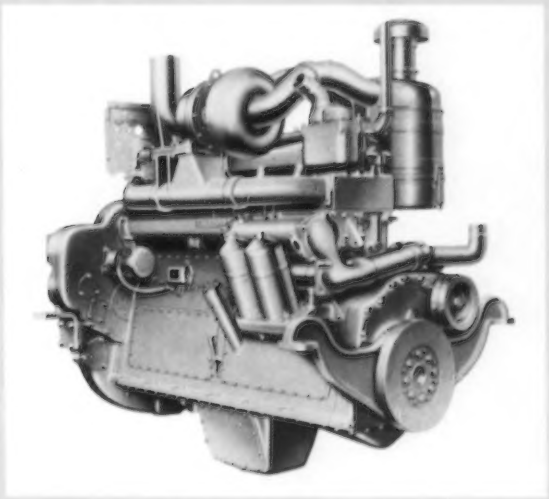
56,200 LB.

. . . Caterpillar Leadership in Action!



FIRST TRACK-TYPE TRACTOR WITH TURBOCHARGER!
The D9's new Turbocharger is driven by the engine exhaust, utilizing energy which would otherwise be lost. In addition, it packs air into the engine according to engine *load*, not speed. This means more working horsepower—greater performance.

CHOICE OF TORQUE CONVERTER OR DIRECT DRIVE!
Two types of drives are available, the exclusive Caterpillar oil clutch with six-speed (forward and reverse) transmission or a three-stage torque converter with 5:1 torque ratio. The transmission used with the torque converter has three speeds forward; two reverse. This option enables you to match the drive you want to your job requirements.



COMPLETELY NEW 286-HP ENGINE!
In addition to the Turbocharger, the powerful new D9 Engine features a 6¼" bore and 8" stroke and runs at 1200 r.p.m. Long life and dependability are promoted by stationary oil jet piston cooling; short, rigid valve push rods give smooth, accurate valve action; "Hi-Electro" hardened gear at the rear of the crankshaft drives timing gears and accessories; and many other advanced features.

WIDE RANGE OF OPERATING SPEEDS!

TORQUE CONVERTER:
3 speeds forward, 0 to 4.1 m.p.h., 0 to 5.7 m.p.h., 0 to 7.8 m.p.h.
2 speeds reverse, 0 to 4.1 m.p.h., 0 to 7.8 m.p.h.

DIRECT DRIVE:
6 speeds forward, 1.6, 2.1, 2.9, 3.9, 5.0, 6.8 m.p.h.
6 speeds reverse, same.

CONSTANT-POWER DRIVE FOR REAR-MOUNTED EQUIPMENT!
You always have power for cable controls, direct from the engine's rear power take-off. This makes cable control operation completely independent of flywheel clutch or torque converter and gives you a big boost in operating efficiency.

The D9 . . .
proven in the field for a year!

Though new, the D9 is already a veteran. After exhaustive proving-ground tests, several D9s have been tested for over 19,128 hours on the toughest jobs in logging, construction, mining and quarry work. These jobs tested every square inch of this mighty new machine. The word from the field: "By far the best big tractor ever made."

Rugged—
and easy to service!

From its one-piece welded steering clutch case-frame assembly, to its track shoes hardened by the "Water Quench" process, the D9 is the toughest crawler built. And it's designed for easy servicing. Oil clutch, torque converter, transmission case and steering clutches can each be removed individually without disturbing other components. Hydraulic track adjusters are among the many other features for fast, easy adjustment and service work.

Brief specifications

Length: 17' 10¾"
Width: 9' 11¼"
Height: 8' 9"
Gauge: 90"
Weight: 54,000 lb. approx., dry
56,200 lb. approx., operating

Easy to operate!

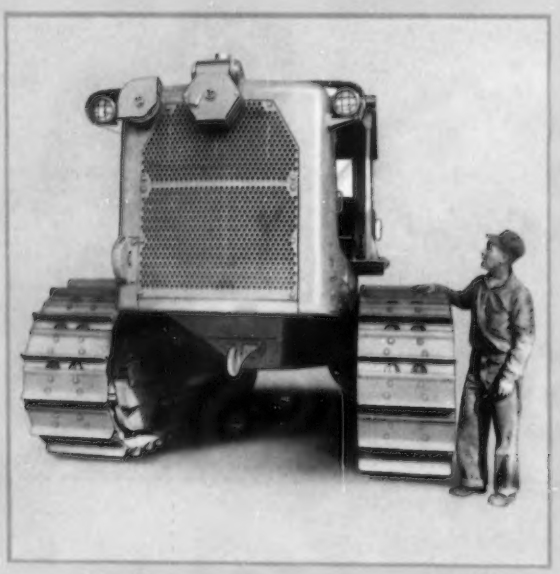
- The independent "live-shaft" drive for cable controls makes operation smoother, easier.
- Hydraulic boosters provide both power steering *and* power braking.
- Adjustable seat, all-around visibility, easy access to all controls make operator's job simpler.
- Important new 7-roller track frame improves stability, flotation and ride.
- New starting engine has electric starting system and simple single-lever control for easy operation from the seat and insures fast starts in all weather.

Equipment

New CAT*-built 'Dozers for the D9: the No. 9S Bulldozer, modified straight blade; the No. 9A Bulldozer, angling blade.

New Cat-built Cable Controls: the No. 29 rear-mounted, double drum; the No. 30 front-mounted, single drum.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



MAIL TODAY!
CATERPILLAR TRACTOR CO., Peoria, Illinois, U. S. A.
I'd like more information on the D9.
Name _____
Company _____
Address _____
City _____ *Zone* _____ *State* _____

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks — ®

THE D9... NEW KING OF THE CRAWLERS

PRINTED IN U. S. A.

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

RUBBER HOSE CHECK LIST will help users obtain longer hose life and better performance. It is an 8½x11 in. cardboard wallchart offered free by the Thermoid Co., Trenton, N.J. **(27)**

AIR DUCT SIZES are quickly determined with a pocket size slide rule from the Ducon Co., according to their release. It is free if you use your company letter head. Called a "Duct Size Calculator," it relates volume, velocity, friction loss and duct size to each other. **(28)**

POCKET SIZE DATA BOOKS are handy, inexpensive things for all, especially for field men. A revised 1955 catalog listing the many technical subjects available has been issued by Lefax Publishers, Philadelphia, Pa. **(29)**

BINOCULAR MICROSCOPES are called "3-D" by Bausch & Lomb in their new eyecatching catalog entitled "Stereomicroscopes." In addition to a well prepared section called A Guide to Selection there is a display of accessories and a price list; not to mention some fascinating 3D pictures of the view through such a 'mike.' **(30)**

SILICONES, a most unusual class of engineering materials, need be no mystery to you. They have very diversified application, from lubricants to dielectrics. Learn something of them from Dow Corning's "Silicone News." Either their Production and Maintenance edition or the one for Design Engineers is yours for the asking. Included in each issue is a list of basic publications available. **(31)**

POWER SHOVEL CONTROL developments are reported in a 12 page booklet from Harnischfeger Corp. Their "Magnetorque," electro-magnetic coupling, and their new electronic controls are discussed. **(32)**

TRACTOR SHOVEL that can be converted into a bullclam, clamshell, skid-shovel or bulldozer at the flick of a handle is illustrated and described in a brochure released by Drott Mfg. Co. The "Four-In-One Skid Shovel" is mounted on an International TD 6 or 9. **(33)**

TRACTOR SHOVELS with rubber tires are treated in the Clark Equipment Co.'s catalog on the 1 cu yd "Michigan 75" series. Also shown in the 12 pages are attachments that can make it useful on many jobs. **(34)**

DIAMOND DRILLING coring service and supplies available from Hillman-Coldset are presented in their latest brochure. The interesting Coldset diamond bit design is well illustrated and explained as are the Hillman coring services. Located in Midland, Texas, they have concentrated on oil. **(35)**

STEEL BUILDINGS is the title and subject of Armco's 24 page manual on their Series S prefab structures. Accessories and erection instructions are included in the descriptions of the several types. Photos of applications from lean-tos to schools are displayed. **(36)**

GROUTING MORTAR for machinery emplacement must have special characteristics. "Embeco" non-shrink grouts are designed for such applications. Their method of use is thoroughly detailed, as well as their composition, in a 16 page bulletin from Master Builders. **(37)**

WAREHOUSING to increase space utilization as well as to simplify handling is considered in the 16 pages of a publication by Frick-Gallagher Mfg. Co. Illustrated examples of space saving shelves and efficient palletizing developed by their staff are presented. **(38)**

INDUSTRIAL SLIDES is an unusual name for an intriguing piece of space saving equipment. They act something like sliding file drawers and allow ready access to equipment that normally can be tucked away in out-of-the-way places. See for yourself by sending for a six page folder put out by Grant Pulley & Hardware Corp. **(39)**

MAN LIFT ELEVATORS save legwork. Humphrey Elevator Co. has a power driven one that needs very little space for installation. It is a continuous belt type with shelf-like steps and hand-holds for quick, up and down, employee transportation. A description and illustration of the device and its safety features are available in a folder. **(40)**

AUTOMATION is the topic of the times. Minneapolis-Honeywell makes it more understandable with their little "Automation Dictionary," a 20 page vest pocket booklet. **(41)**

CONTROLS & INSTRUMENTS galore and what they can do for you, fill a 24 page letter size "Composite Catalog" also put out by the Honeywell people. Fascinating, concise and covering an enormous range, it also lists their series of even more comprehensive and well prepared literature available on each specific type of control. **(42)**

BIN LEVEL INDICATORS are illustrated and described in the 4 page "Bin Vue" pamphlet published by Convair, Pittsburgh, Pa. **(43)**

LIQUID LEVEL GAUGES that indicate, record and/or control are treated in detail by The Bristol Company in their bulletin L 701. **(44)**

REMOTE WEIGHING by the "Select-O-Weight" system permits automatic proportioning of any number of any kinds of any ingredients from any vessel for any process. It is described in a Richardson Scale Co. bulletin. **(45)**

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after July 1, 1955 if mailed in the U. S. or Canada.

MAY 1955

NOT GOOD AFTER JULY 1, 1955
if mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

My Name ..... Position .....

Company .....

Address .....

E&MJ NEW PRODUCTS DIGEST

TEMPERATURE MEASUREMENT & CONTROL devices applied to open-hearth roofs are covered in two 2 page Process Data Sheets by Leeds Northrup Co. One details the use of a direct sighting method; the other, a "Target Brick" method. (46)

TEMPERATURE CONTROLS for furnaces and ovens in the lab, pilot plant, or production are described in Blue M Electric Co.'s 4 page brochure on the "Power-O-Matic." (47)

HYDRAULIC CYLINDERS to actuate any of your equipment, have their vital statistics given in a new 8 page bulletin from Miller Fluid Power Co. (48)

CONTROL DEVICES for general purposes are treated in a recent General Electric catalog. There is a special section on selection of motor controls. (50)

BRAZING METHODS including the design of brazed joints, prebraze cleaning, selection of brazing and filler metals are a few of the subjects discussed in the "Brazing Manual" by Air Reduction Sales Co. (51)

DIPPER TEETH REPOINTERS for power shovels come in several styles designed for specific work. The styles and how to repoint are presented in a revised guidebook from American Manganese Steel Div. of American Brake Shoe. (52)

WELDING by hand can be simplified, done faster and done at lower cost by using the methods given in bulletin 1343 from The Lincoln Electric Co. It describes the Idealarc equipment. (53)

CASTINGS that combat destructive service are dealt with in a booklet describing International Nickel's alloys and services in this line. (54)

ALLOY STEELS and their economic advantages are discussed extensively in a large 200 page handbook offered by Climax Molybdenum Co. (55)

PNEUMATIC CONVEYING systems that are typical of the many engineered by Convair are diagramed and discussed in a 12 page bulletin by the company. Capable of handling a wide variety of dry materials, an installation is checked in a company pilot plant before any contract is accepted. (56)

FLOTATION of a complex lead-zinc-copper-pyrite ore in Germany using "Sub A" machines is the subject of Engineering Notebook Bull. M4-B73 put out by Denver Equipment Co. The complete milling operation is given. (57)

HIGH TENSION SEPARATION has come a long way. Several methods—lifting, pinning, or a combination—can effect separation of a long list of minerals in the 8 to 250 mesh size. Carpco Engrg. & Mfg. explains it in the 4 page bulletin HTB-103. (58)

MAGNETIC PULLEYS of the permanent type eliminate the need for electrical power and accessories. Information on them is given in a new 8 page pamphlet on the "Hercules" brand of Homer Mfg. Co. (59)

AUTOMATIC SAMPLING methods and equipment are discussed in another of Denver Equipment Co.'s practical bulletins. Eleven pages long, it's titled "Denver Samplers." (60)

VACUUM FILTERS, horizontal rotary type, described in a release of Filtration Engineers, are recommended especially for coarse crystalline materials, fibrous pulps, and other free settling or free-filtering applications. (61)

FILTER FABRICS FACTS is the title of an illustrated 8 page booklet which summarizes the special field very well. From Wellington Sears Co. (62)

WATER TREATMENT gets the old one-two in the 40 page "Handbook on Demineralizing" by Cochrane Corp. Comparisons of various methods, operating costs, flow sheets and photos. (63)

WASTE TREATMENT equipment available from Graver Water Conditoning Co. is briefly shown in the 4 pages of a recent release. (64)

DIESEL ENGINES, 6 cyl from 200 to 575 hp, made by GM and designated as the "Series 110," are announced in Brochure "Power for Progress." Selection is aided by the operating data and photos of applications presented. (65)

CENTRALIZED LUBRICATION systems are small and inexpensive devices that eliminate the guesswork on ordinary grease gun lubrication. They are easy to operate and the "Multival" equipment from the Farval Corp. reduces up to 12 fittings to one. (66)

EDDY CURRENT BRAKES operate smoothly without shock. This simple braking device has no parts to wear, not even electrical contacts. Especially adaptable to accurate speed control, Dynamatic Div., Eaton Mfg. Co. has a bulletin on them. (67)

GEAR DRIVES, Link-Belt's parallel shaft type, are comprehensively covered in a 32-page book. The how of selection is concisely told in three pages. (68)

POWER TRANSMISSION & CONVEYING EQUIPMENT available from the Link-Belt Co. are combined in a 340-page volume which they feel covers one of the most complete lines of such equipment. (69)

MOTORPUMPS of Ingersoll-Rand are publicized in a new bulletin. Designed to make it easy to select the correct size and model, the 24 pages give a pumping problem with solution and performance data, as well as specifications. (70)

PROTECTIVE COATINGS using "Phenoline 300" can fit special corrosive conditions even better with the new modifications developed. The full line of six phenolic compounds are compared in a chart contained in a brochure from Carboline Co. (71)

SEALS, GASKETS, OR PACKING might be the classification for Garlock Packing Co.'s "O Rings." A ring of resilient material inserted in a groove, it serves equally well in dynamic or static applications. More information is available in a new catalog. (72)

FIRST CLASS
PERMIT NO. 64
(Sec. 34.9, P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in The United States

Postage Will Be Paid By—

McGRAW-HILL PUBLISHING CO., INC.

ENGINEERING & MINING JOURNAL

330 WEST 42nd STREET

NEW YORK 36, N. Y.

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers on reverse side, tear out and mail.

Here's your Blaster—

Your Blaster is well off the rock pile. He's all set to shoot the big chunks *wherever they lie.* Each hole is primed with fuse and cap, and the fuse has been hooked up with *Quarrycord.*

Ensign-Bickford Quarrycord is a flexible, water-resistant cord which burns with an external flame at the rate of about one foot per second. A connector, crimped on the free end of each fuse, provides a positive connection for the Quarrycord.

Notice that the hook-up employs cross connections at fairly close intervals. This is done to get the fire there faster — to make sure that each safety fuse is ignited in time to *burn below the collar of the hole before the first charges fire.*

Now you can do your Secondary Blasting in *one* operation without causing one big blast. You can fire when ready, from a point of easy retreat. Quarrycord is not affected by stray electrical currents.

Ensign-Bickford Quarrycord is packed on spools in 500 ft. lengths. See your Explosives Supplier, or write to

THE ENSIGN-BICKFORD COMPANY

Simsbury, Connecticut

Manufacturers of Primacord® Detonating Fuse, Safety Fuse, Ignitacord®, Blasting Accessories.

Established 1836

and here's the Hook-up!

(PLEASE GIVE THIS ADVERTISEMENT TO YOUR BLASTING FOREMAN)

ENSIGN-BICKFORD

Quarrycord

for lighting Safety Fuse in Secondary Blasting

Q-3

7 important Dumptor advantages

Take another look at the latest model Koehring 6-yard Dumptor shown here. It has some important features worth checking. Notice how heavy snubber-spring on steering axle cushions road shocks — yet retains Dumptor's unique advantage of no spring maintenance. There are no leaf springs. Big shock-absorbing drive tires eliminate need for springs on the drive axle.

Alignment of drive wheels with steering wheels adds to efficiency of Dumptor no-turn shuttle hauling — makes a big difference in traction and flotation when Dumptor is shuttling back and forth across loose stockpiles, soft ground.

Another basic Dumptor advantage is instant gravity dump. It's controlled by a simple body latch and new dump lever arrangement. Gravity dumping eliminates slow-acting, troublesome body hoists — never balks, never wears out. Notice, too, the new streamlined, all-steel body. Even with all this heavy-duty strength, Dumptor still has more than 6 h.p. for every ton of loaded weight. It accelerates fast, pulls through soft ground and up grades with less shifting — climbs 24% grades fully loaded.

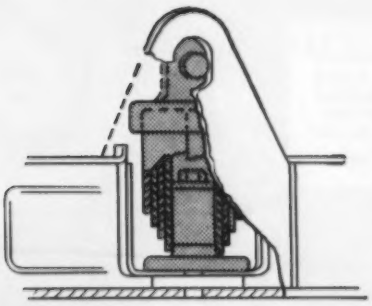
Let your Koehring Distributor give you all the latest Dumptor® facts. See him soon, or write.

KOEHRING COMPANY

MILWAUKEE 16, WISCONSIN

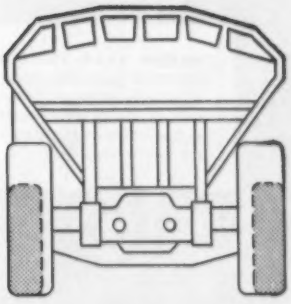
Subsidiaries: PARSONS · KWIK-MIX · JOHNSON

K437



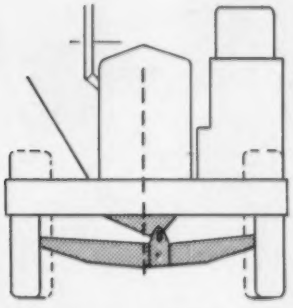
Smooth ride

Heavy, snubber-type spring is mounted between Dumptor main frame and the steering axle. Shock-absorbing action provides plenty of "cushion" — takes all the jolts out of rough, off-road travel. Easy on operator and machine.



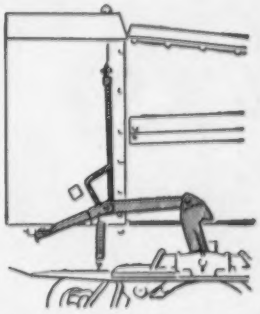
Tires track in direct line

Wider, heavier steering axle puts Dumptor steering wheels in direct line with big drive wheels. Tires track in the same path. There's less rolling resistance, better traction in soft ground, and on rough haul roads.



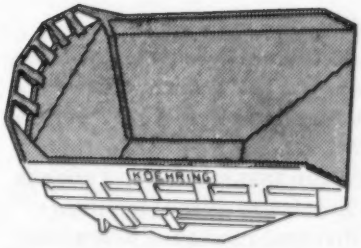
Off-set pivot on axle

Pivot point on steering axle is off-set from center line 3¼" toward operator side of machine. There's no sag, even with unbalanced load. Steering axle oscillates up to 21" — keeps twisting strains out of Dumptor main frame.



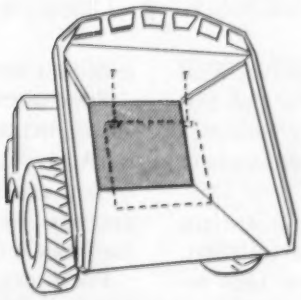
New body-latch, dump lever

Body latch for 1-second gravity dumping is simple, trouble-free. Latch is engaged by a single hook, mounted on the chassis frame. Dump lever is located inside the cab, in an easy-reach position to left of operator.



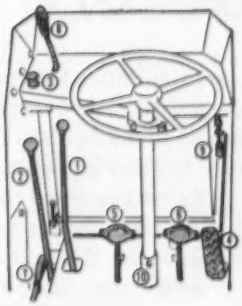
Streamlined, all-steel body

Inside is free of bulges or ledges. Top edge is box-beam constructed. Sides, ends are ribbed with 5 and 8" channels. Double-plate bottom is lined with multiple steel beams. Note ridge bar added to sturdy rock-guard teeth.



Bolted or free-swinging pan

Heavy steel kick-out pan is ½" thick. Pan can be bolted to body floor for extra protection when loading rock. Remove bolts, and pan has free swinging kick-out action — breaks suction when dumping wet or sticky materials.



Easy-reach controls:

(1) Speed gear shift lever, (2) directional gear shift lever, (3) starting aid, (4) foot throttle, (5) clutch pedal, (6) brake pedal, (7) parking brake, (8) body-release lever, (9) hand throttle, (10) running lights control switch.

TWELVE YEAR TD-14 PERFORMANCE RECORD prompts Acme to put 2 new TD-14As on expanded operations. Here one of new tractors dozes blasted limestone for shovel loading into haul trucks far below surface.

"We Worked Our TD-14 12 Years Before Trading"

Says E. H. Warren, superintendent of Acme Limestone Company's underground mine

The Acme Limestone Company, Fort Spring, West Virginia, got the low-down on durability and performance of INTERNATIONAL crawlers by working a TD-14 for 12 years piling up blasted limestone for a shovel in its underground mine.

With Acme expanding operations, this ancient crawler that took the pounding on the roughest, toughest assignment imaginable has now been replaced by two INTERNATIONAL TD-14As and dozers. They produce approximately 150 tons hourly from a 21-foot seam of high calcium limestone.

Superintendent E. H. Warren says, "*We have been 100% INTERNATIONAL on crawlers since 1942 with our first TD-14 working 12 years before being traded. The all-around production and service we get from INTERNATIONALS speaks for itself when we buy more as replacements.*"

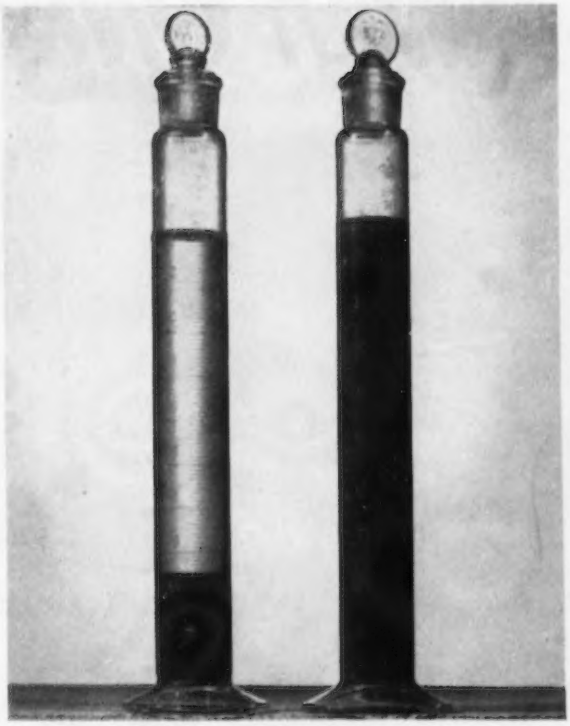
For a long-term, dividend-producing investment in pit or quarry crawler tractor power, see your International Industrial Power Distributor. He'll demonstrate any of the seven INTERNATIONAL crawlers equipped to do your work. Then you can see for yourself how these machines pay off with peak production in handling rock, gravel or sand at less cost.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILL.

INTERNATIONAL
INDUSTRIAL POWER
MAKES EVERY LOAD A PAYLOAD

INTERNATIONAL HARVESTER

Dow Announces
SEPARAN 2610
a superior flocculant



SEPARAN 2610 IMPROVES SETTLING RATE. The cylinder on the right shows untreated ore pulp containing 15% solids. The cylinder on the left containing the same pulp has been treated with .03 lb. SEPARAN 2610 per ton of dry solids. The picture was taken 30 seconds after addition of SEPARAN 2610 and agitation.

SEPARAN 2610 IMPROVES FILTRATION RATE. Filter above shows thin cake formed by untreated material. Filter below shows thick cake collected in the same length of time using SEPARAN 2610. This heavy, porous cake is much lower in moisture than the untreated material.

Under both laboratory and mill conditions, SEPARAN* 2610 has shown the following advantages over other flocculants:

- ★ Stepped up settling rate
- ★ Increased overhead clarity
- ★ Improved filtration rate
- ★ Decreased filter cake moisture
- ★ Increased recovery
- ★ And reduced cost—even as low as 1/10 of a cent per ton of solids.

Prove to yourself the advantages of SEPARAN 2610. Send this coupon in today for your trial sample and literature. THE DOW CHEMICAL COMPANY, Midland, Michigan. *Trademark

THE DOW CHEMICAL COMPANY
Dept. TS-788 B-1, Midland, Michigan

Please send me further information and a trial sample of SEPARAN.

Name_____

Company_____

Address_____

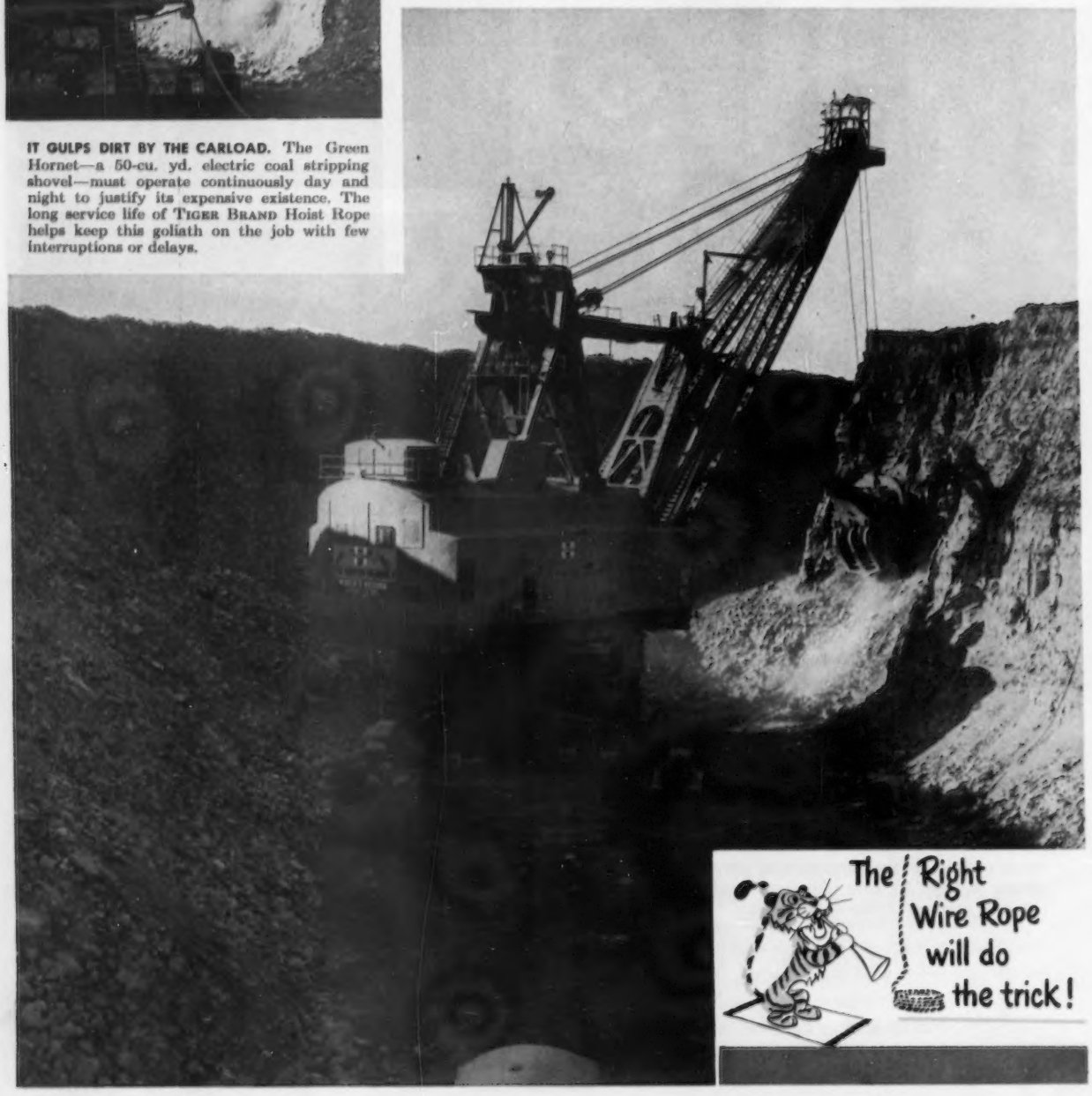
City_____ State_____

you can depend on DOW CHEMICALS

DOW

Over a million with ONE

IT GULPS DIRT BY THE CARLOAD. The Green Hornet—a 50-cu. yd. electric coal stripping shovel—must operate continuously day and night to justify its expensive existence. The long service life of TIGER BRAND Hoist Rope helps keep this goliath on the job with few interruptions or delays.



yards of tough digging

Tiger Brand Hoist Rope

THE first TIGER BRAND Hoist Rope installed on this coal stripping shovel worked 65 shifts in 23 days before it was replaced. It moved 1,161,155 cu. yds. of overburden in those three weeks.

That's good service in a punishing coal stripping operation. This big 50-cu. yd. shovel is busy every hour of the day and night, stripping overburden for Hanna Coal Company at Georgetown, Ohio. It averages as high as 54,000 yards a day. Its hoist rope really has to be *rugged* to work at that clip. The first TIGER BRAND Rope worked so well that an identical TIGER BRAND Hoist Rope replaced it.

This is not a unique case. We know of many TIGER BRAND Ropes on heavy-duty earth moving equipment that have moved a million or more yards before replacement. In cases of easier digging, service in excess of 2,000,000 cubic yards is not unusual. On *any* job, the correct TIGER BRAND Rope gives you the longest possible service . . . steady, rope-after-rope performance that *keeps down costs.*

Send the coupon for more information.

FREE ROPE BOOKLET

American Steel & Wire
Dept. C-55, Rockefeller Building
Cleveland 13, Ohio

Please send me, without obligation, a copy of your helpful wire rope selection guide, "The Right Rope for the Job."

Name .....

Company .....

Address .....

City & State .....

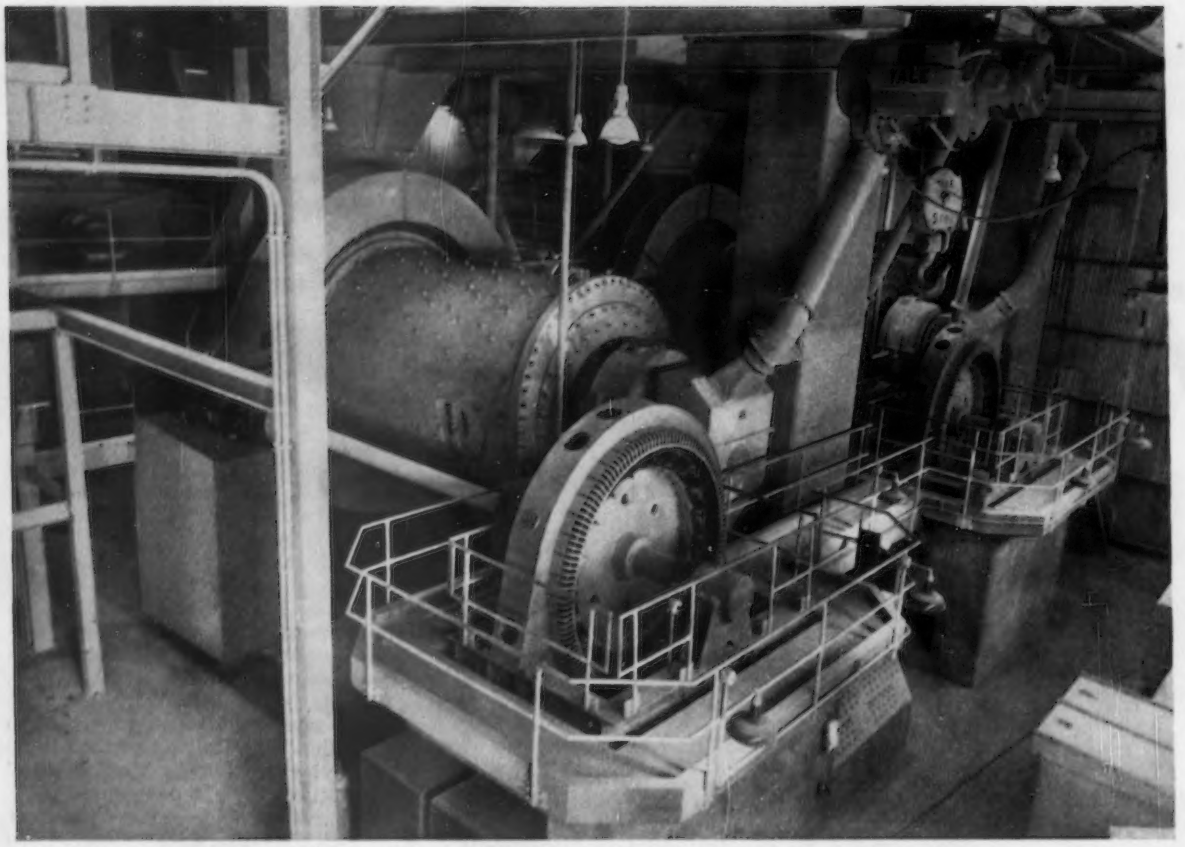
AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

USS

Excellay Preformed

UNITED STATES STEEL



Two 10′ 6″ x 16′ 0″ Traylor Ball Mills in a Cement Plant. Both are 1000 H.P. mills.

TRAYLOR ENGINEERS START GRINDING MILL DESIGN WITH

Your end-product in mind

Every Traylor Grinding Mill is individually engineered and built to exacting specifications developed from data furnished by the customer. In addition, every Traylor mill includes many proved features which combine to assure you more efficient, economical production . . . a more uniform end-product . . . of the proper size.

Traylor mills feature steel gears . . . precision cut with high and low addendum on our MAAG gear generator. Main bearings are fitted with a high pressure pump. This pump coats each trunnion with a film of grease which lifts and floats the mill to overcome high starting torques and eliminates undue wear caused by "dry" starting after a shut down. Traylor mills are built in all sizes up to and including 1500 H.P.

For additional information on Traylor Grinding Mills send for illustrated Bulletin #6121.

TRAYLOR ENGINEERING & MFG. CO.
772 Mill St., Allentown, Pa.
Canadian Mfrs.: Canadian Vickers, Ltd., Montreal, P. Q.

A Traylor leads to greater profits

SEND FOR BULLETINS
. . . just mention the Traylor Equipment that interests you.

SALES OFFICES · NEW YORK · CHICAGO · SAN FRANCISCO

Reynolds Metals Company's La Quinta Alumina Plant Corpus Christi, Texas

Engineered Economy

IN EXTRACTIVE METALLURGY

This forty-million dollar ore-processing plant recovers pure alumina — 365,000 tons a year — from Jamaican bauxite. By advances in engineering and design, the operation makes possible the economic processing of a new type ore.

Evaluation of the economics of such operations, the engineering and construction of the complete plants, like the one shown above — these are important parts of Braun's services to the mining, metallurgical, and chemical industries.

Braun
engineers

C F BRAUN & CO ALHAMBRA CALIFORNIA · *NEW YORK · HOUSTON · SAN FRANCISCO*
CHICAGO · TULSA · C F BRAUN OF CANADA LTD · BRAUN TRANSWORLD CORPORATION

HOW TO BUY CONVEYOR BELTS

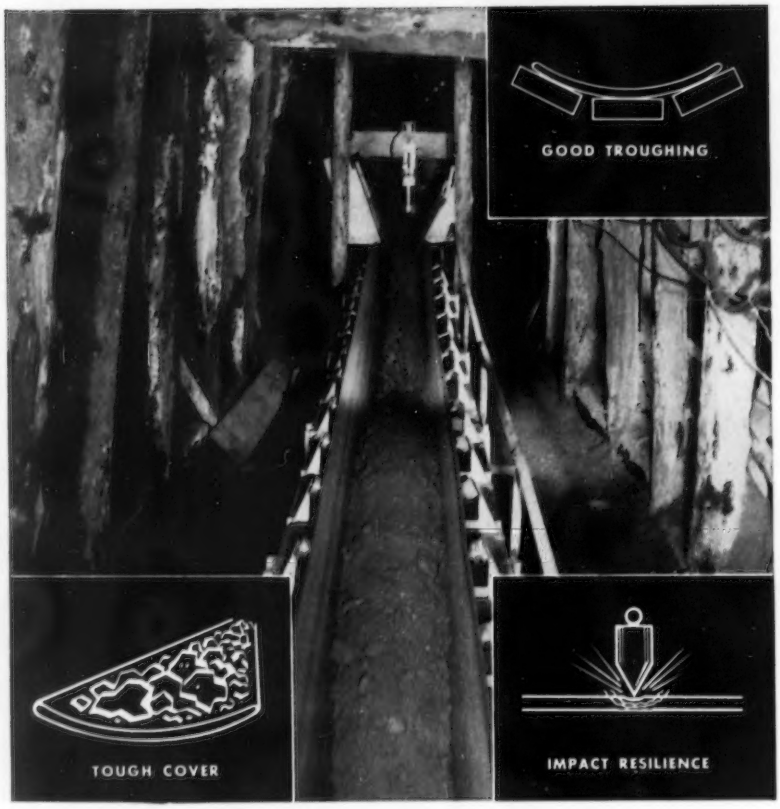
FOR LARGE LUMPS, ABRASIVE LOADS

and get "More Use per Dollar"

Select a belt that assures both maximum flexibility *and* loading impact resistance. One that has high draw-bar strength plus the ability to hold fasteners, and a cover that truly protects and prolongs belt life.

Heavy conventional duck belt constructions fail to provide the needed flexibility and resiliency to absorb heavy loads. They are stiff and "boardy", hard to train on the idlers. Look for a conveyor belt with strength members specially woven to trough easily and cushioned to withstand shock loading. Make certain the belt is moisture and mildew-proof, with protective outer plies and sufficient cover thickness to resist wear and prolong belt life.

Specify by name, the one conveyor belt that offers all these features . . . Ray-Man "F" Conveyor Belt.



RAY-MAN "F" CONVEYOR BELT

This Manhattan conveyor belt combines elastic cushioned inner plies in an outer envelope of strong, yet flexible, synthetic fabric . . . to withstand large, abrasive lumps . . . to permit easy troughability, even where only a thick, narrow belt is used. Special synthetic outer-plies provide maximum elasticity for rounding small pulleys in confined areas. Ray-Man "F" is mildew-proof and, like all Manhattan heavy duty conveyor belts, its service life is greatly prolonged by R/M's exclusive "XDC" Cover which protects it against abrasion, cuts and tears. For unusually abusive shock loading problems you may find extra-cushioned Homocord your best conveyor belt buy . . . or Ray-Man Tension-Master for extra long lifts.

Let an R/M representative help you select the best conveyor belt to meet your job requirement . . . you'll get "More Use per Dollar".

RM-500-UG

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

Now you can drill 6¾ to 9-in. blast holes

fast and economically—

BUCYRUS ERIE

40-R ROTARY

The new 40-R is another significant Bucyrus-Erie advance in rotary blast hole drills. Flexible and powerful, it puts down medium-large holes quickly and efficiently in both hard and soft formations.

Continuous progress in any material is assured by this exclusive combination of features: *variable drilling speed* through Ward Leonard electric control and *variable down pressure* through hydraulic motor control.

The Ward Leonard variable-voltage system gives the operator smooth, instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation — can vary the speed as required without stopping the drilling operation. In hard formations maximum down pressure may be exerted on the bit while the drill pipe is turning slowly. In soft material, rotating speed can be increased substantially as down pressure is automatically reduced.

There are many other features that contribute to low operating costs and long machine life. Write today for full details and specifications on the 40-R, available with either diesel-electric or full electric power.

18855C

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

STURTEVANT MICRONIZER* GRINDING MACHINE

Grinds Materials To Any Micron Size Specification

NOW AVAILABLE FOR OUTRIGHT SALE

24" Size
Capacities 1000 to 1200 lbs. per hour

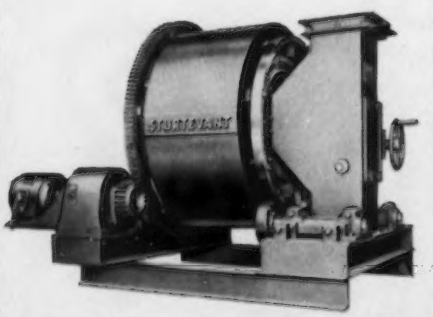
The Sturtevant *Micronizers* are fluid jet grinding machines designed to reduce solid materials to particle sizes in the micron range.

Using compressible fluids, air or steam, as the source of energy, *Micronizers* produce pulverized materials to specifications unobtainable by other mechanical equipment such as ball, pebble or hammer mills.

The variety of materials processed is large and includes both nonmetallic and metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products.

It is quickly and easily cleaned on changes of formulation with minimum loss of material. Simple to install and operate. It is available as a machine alone . . . or as a complete grouping with premixing, grinding and bagging equipment. Write for complete information, today.

*Micronizer is the Registered Trademark of the Sturtevant Mill Company.



Sturtevant Dry-Batch Mixer for mixing materials into a homogeneous mass. 5 models: ¼ to 2 tons.

STURTEVANT MILL COMPANY

101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

TOPS IN TEAM WORK—ALL THREE

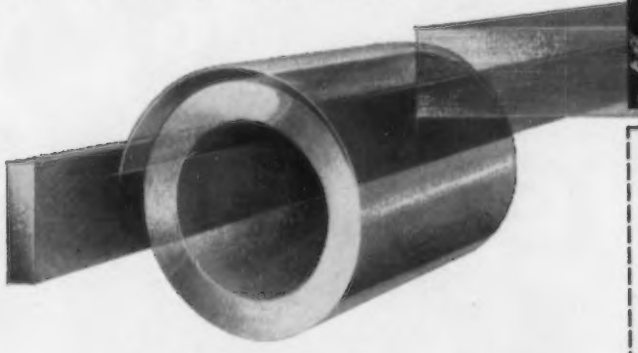
each does a special job

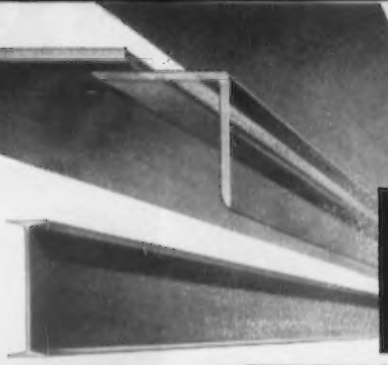
J&L's JALTEN series offers you three top performing high strength, low alloy steels with the following characteristics:

JALTEN NO. 1—High strength, good formability and fabricating—good resistance to low temperature impact.

JALTEN NO. 2—High strength, moderate forming—improved resistance to atmospheric corrosion.

JALTEN NO. 3—High strength—improved abrasion resistance.





J&L STEEL

SEND FOR THIS NEW BOOK:

Chemical properties of Jalten
Mechanical properties of Jalten
Jalten equivalents
Jalten application data

Jones & Laughlin Steel Corporation
Dept. 412—3 Gateway Center
Pittsburgh 30, Pennsylvania

Please send a copy of your Jalten booklet, *JALTEN LOW-ALLOY, HIGH-STRENGTH STEEL.*

NAME_____

TITLE_____

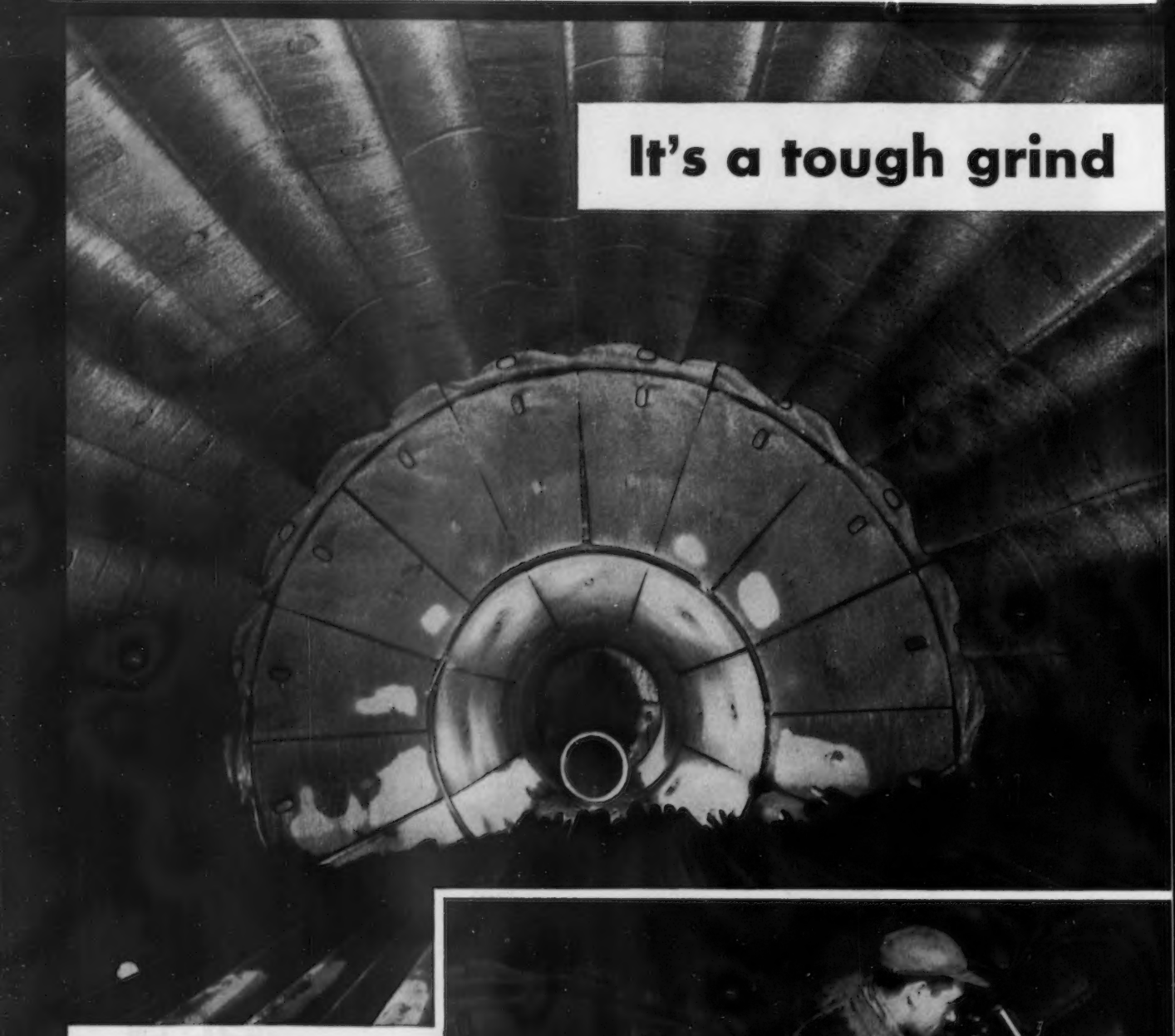
COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

It's a tough grind



These photographs made inside one of Pilotac's Rod Mills clearly show the condition of the lining at the 680,000 ton mark. Notice the remaining wave as contrasted against the feed end liners.

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

when you're handling Taconite...

so they use USS Lorain Rolled Plate Linings

GRINDING a material as hard as iron-bearing taconite is really a tough job. Many milling authorities agree that Minnesota's Taconite ranks among the hardest ores to grind. The linings in Grinding Mills are subjected to extremely severe abrasion and considerable impact. An extraordinary lining is required to pass such a test. Here is an actual case history of what USS Lorain Rolled Plate Linings can do.

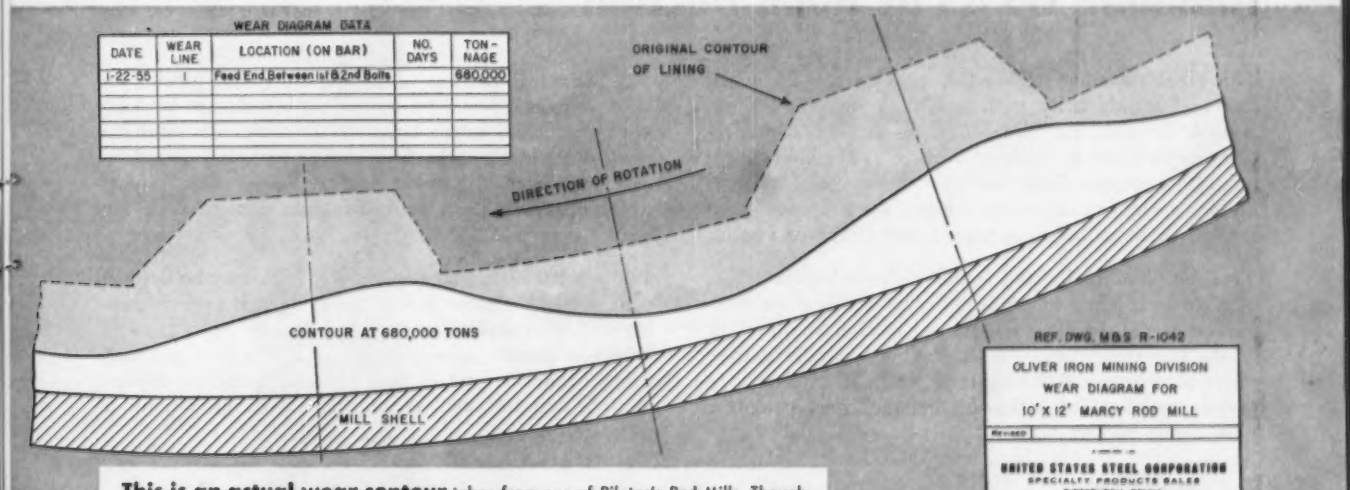
USS Lorain Rolled Plate Linings were specified for the 10′ 8″ Diameter Marcy Grinding Mills, built by the Mine and Smelter Supply Company of Denver, for "Pilotac"—Oliver Iron Mining's Pilot Taconite Plant at Mountain Iron, Minnesota.

Result: In one Rod Mill, over 680,000 tons of crude ore have been reduced by wet grinding from ¾" feed to a 10 mesh ball mill feed—yet lift has been maintained. Consider the punishment the mill linings have taken. A combination of the hardest of ores with a constant load of 70 tons of steel rods up to 4" in diameter have pounded away almost without stop. A study of the accompanying photographs and wear diagram indicates a considerable amount of lining remains—enough to grind many more thousands of tons of ore.

What makes this long life possible? USS Lorain Rolled Plate Linings are made of high carbon rolled steel liner plates and special heat treated alloy rolled steel lift bars. A marked differential in hardness favoring the lift bars is provided intentionally to maintain a constant lift height during the liner life and provide the rod or ball activity needed for efficient grinding. The wear on the harder lift bars, subject to both the abrasion of the ore and the impact of the rods or balls is thus correlated with the lesser wear on the liner plates caused primarily by the abrasion of the ore. Unlike castings, this "Dual-Hardness" feature insures lift until liner plates wear clear through to the shell. An additional feature of USS Lorain Rolled Plate Linings is the trouble-free special carbon manganese, heat treated, forged steel bolts used throughout. Operators readily appreciate the feature of "no bolt replacements." And closer tolerances between plates helps to eliminate shell wash and allied troubles that cause eventual wear to the mill shell.

Write to us now for the names of leading mill manufacturers who can supply you with USS Lorain Rolled Plate Linings.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



This is an actual wear contour taken from one of Pilotac's Rod Mills. Though this lining has ground over 680,000 tons of taconite, lift has been preserved, and many more thousands of tons of ore can be successfully ground.

USS LORAIN ROLLED PLATE LININGS *and* USS GRINDING BALLS

S-862

UNITED STATES STEEL

Stockpiles Phosphate Rock 7 Stories High—and Keeps Handling Costs at Rock Bottom

Stacker discharges 1088 foot center trunk line belt conveyor to either side. Rock is piled at a rate of 635 long tons per hour.

This giant traveling stacker has a "wingspread" of 220 feet and stands taller than a 7 story building. Engineered by S-A for the Virginia-Carolina Chemical Company's plant at Nichols, Florida, it stockpiles huge quantities of phosphate rock for drying prior to final moisture removal in a huge kiln. Rock moves from storage to the kiln via a tunnel belt conveyor system.

The phosphate rock is fed to the stacker wing conveyors by a 36-inch trunk line belt conveyor running on 1088 foot centers along the storage area. Rock flows to either of the two wing conveyors extending from the stacker tower at a rate of 635 long tons per hour. Rail clamps permit stationary operation of the stacker which forms piles about 90 feet high.

S-A "Simplex" carriers with spun end rollers turning on roller bearings protected by labyrinth seals are used on both trunk and boom belts. Other design features include S-A Hold-Backs which prevent belt reversal in case of power failure and Spring Type Belt Wipers which insure a clean belt surface in contact with the return rollers.

While a stacker piling rock 90 feet high may be beyond your needs, the same S-A engineering and manufacturing skill is available for your own specific problems—to help *you* handle *your* product at lowest cost per ton, using whatever type of bulk material handling equipment is best for you. Write, without obligation, for a free survey.

SINCE 1901 S-A STEPHENS-ADAMSON MFG. CO.

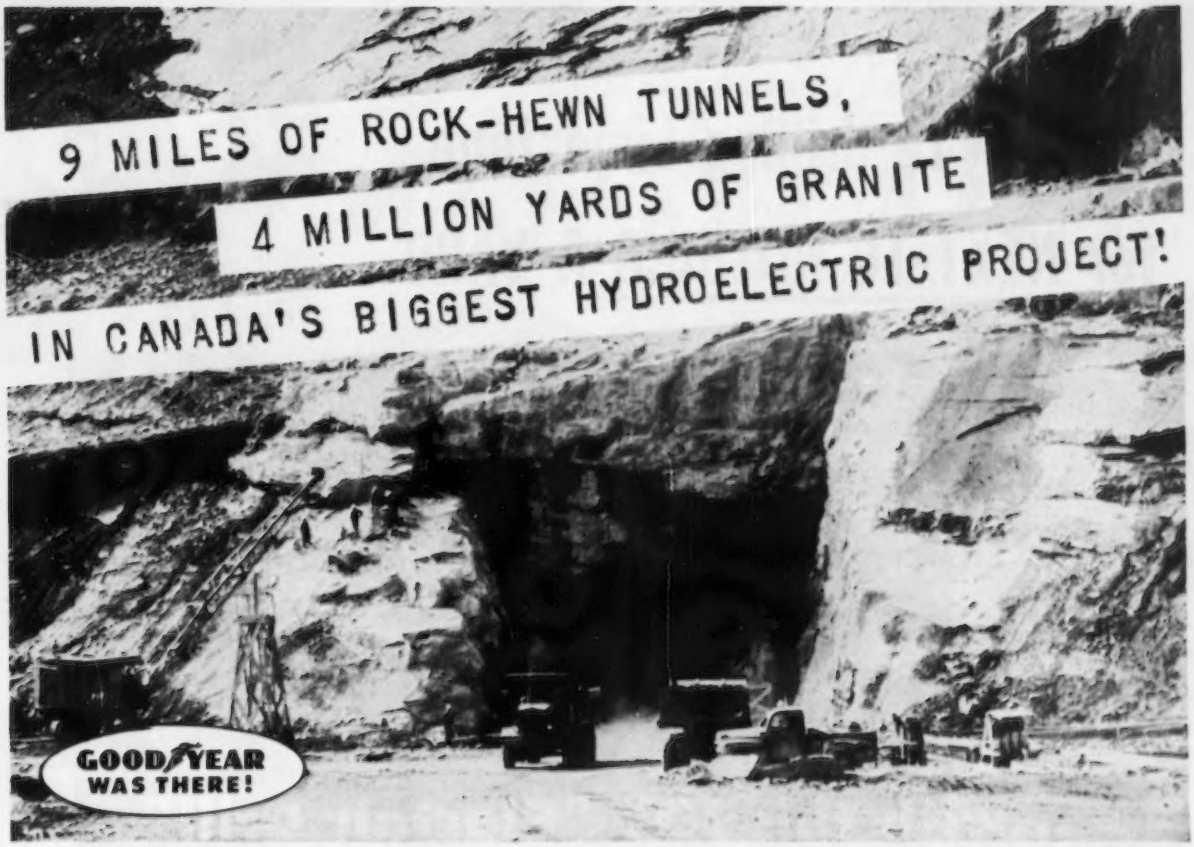
STEPHENS-ADAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Ill. • Los Angeles, Calif. • Belleville, Ont.

Engineering Division
Specialists in the design and manufacture of all types of bulk materials conveying systems.

Standard Products Division
A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.

SealMaster Division
A complete line of industrial ball bearing units available in both standard and special housings.



5,000 MEN and a huge intercompany pool of equipment are damming the Bersimis and Desroches rivers so 1,200,000 horsepower can electrify southern Quebec and the Gaspé Peninsula. Photo shows rock haulers at mouth of 35-foot diameter, 9-mile tunnel that leads to subterranean powerhouse 565' x 65' x 80' – carved and blasted out of granite too tough for drills! It takes phenomenally durable tires to stand up to the tremendous loads and razor-sharp blasted rock – which is a reason why GOODYEARS ARE THERE!

Look for this sign; there's a Goodyear Dealer near you

3-T NYLON CORD

provides toughest tires in Goodyear history!

Underneath the armored treads and sidewalls of Goodyear off-road tires is something new and wonderful—3-T NYLON CORD, *exclusively Goodyear's.* It gives tires such vast new durability that users say bruise-breaks and heat-blowouts are practically unknown! Tire growth is controlled—and ply separation and flex failures are virtually eliminated! 3-T NYLON CORD has *added so much* to tire life—*subtracted so much* from operating costs—that you should see the facts-of-record before buying or specifying *any* tire for *any* operation. Goodyear Truck Tire Dept., Akron 16, Ohio.

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE BUILT WITH 3-T NYLON CORD

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, All-Weather, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

They're drilling Limestone for NEXT-TO-NOTHING A YARD...

...with this JOY "Blastair Drill"

In a Texas limestone quarry, a Joy Model 225 "Blastair" Drill set the following performance record . . . with a drilling cost of *less than two cents a cubic yard:*

Bit Size		6¼"
Footage Per Shift		300
Labor Cost Per Shift (Driller & Helper)	$20.80	
Fuel Cost Per Shift	5.00	
Lubricating Oil Cost Per Shift	2.00	
Total Labor & Fuel Cost Per Shift		$27.80
Labor & Fuel Cost Per Foot	$ .093	
Bit Cost Per Foot	.134	
Total Labor, Fuel, Bit Cost Per Foot		.227
Cubic Yards Broken Per Foot		13
Total Drilling Costs Per Cubic Yard		.0174

Performance figures will vary, of course, with other formations. However, they show the possibilities of cutting *your* drilling costs with this outstanding Joy drill.

The "Blastair" is a truck-mounted, rotary, "air-blast" drill. It is a fast mover between holes and is easy to set up in drilling position. Its outstanding features include hydraulic automatic chuck, heavy-duty hoisting drum, oil-bath chain-case power unit, and rugged sectional mast. It is a real top-performance, low-maintenance machine that is ideal for the rough jobs of quarry and open-cut mine drilling.

Find out for yourself how the Joy "Blastair" can cut drilling costs on your job as it did this. Write today for Bulletin RM-709 to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

GASOLINE OR DIESEL DRIVE • 6¼" MAX. DIA. HOLE
20' FEED • DRAG OR ROTARY-CONE TYPE BITS

Consult a Joy Engineer

OR WRITE FOR BULLETIN RM-709

W&D M5585

JOY

PIONEER AND WORLD'S LARGEST MANUFACTURER OF ROTARY BLAST HOLE DRILLS

Cyanamid REAGENT NEWS

"ore-dressing ideas you can use"

AEROFLOAT® *Promoter Combination Improves Cu, Precious Metal Recovery*

Recent testing at a Canadian operation recovering copper and associated gold and silver by flotation indicates that partial replacement of AEROFLOAT 208 Promoter and amyl xanthate with AEROFLOAT 242 Promoter gave improved recoveries over the former combination. Data shown below for two one-month periods indicate the improved results obtained which the mill superintendent attributes to the more efficient reagent combinations.

Collector Addition, lb./ton	with AEROFLOAT 242	without AEROFLOAT 242
AEROFLOAT 208 Promoter	0.018	0.029
AEROFLOAT 242 Promoter	0.013	—
Amyl Xanthate	0.007	0.010
(Pine Oil, Sodium Cyanide and Soda Ash also used)		
Recovery, %		
Cu	93.3	91.8
Ag	78.5	65.5
Au	68.9	60.0
Tailings Assays		
Cu, %	0.080	0.143
Ag, oz./ton	0.0016	0.0026
Au, oz./ton	0.051	0.118

If you are having trouble making grade with suitable recovery, it will pay you to investigate the use of the AEROFLOAT Promoters, alone or in combination with each other or with xanthate. Cyanamid sells a complete line of xanthates, liquid and solid AEROFLOAT Promoters and a variety of AEROFROTH® Frothers, pine oil and cresylic acid. Please address your inquiry to our nearest office.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

Cable Address — Limenitro, New York

NORTH AMERICAN CYANAMID LIMITED
Royal Bank Bldg., Toronto 1, Ontario, Canada
CYANAMID DE MEXICO, S. A.,
Apartado No. 26012, Mexico 12, D. F., Mexico

CYANAMID PRODUCTS, LTD., Bush House,
Aldwych, London W. C. 2, England
SOUTH AFRICAN CYANAMID (PTY.) LTD.,
P. O. Box 7552, Johannesburg, Union of South Africa

E. P. CADWELL, Casilla 12983,
Correo 11, Santiago, Chile
G. B. O'MALLEY, MALCOLM GLEN,
377 Little Collins St., Melbourne C. 1, Australia

Printed in U. S. A.

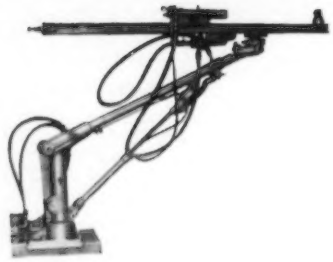
Whatever the job—

THERE'S A CP TO DRILL IT

IDEAL FOR SOFTER ROCK FORMATIONS —
the CP-555 Rotauger's fast, powerful rotary drilling motor and its entirely independent rotary feed motor combine to more than double your footage in the softer formations. Available for wet or dry drilling, drills 2½" holes in speeds of 2 to 4 feet per minute to depths of 100 feet or more.

TWO TYPES OF AIRLEGS— engineered to withstand constant recoil shock yet hold the drill firmly to the work, the CP Airleg affords the maximum drilling efficiency obtained when using Tungsten-Carbide bits. Available in attachable types for conversion of standard sinkers to airleg operation and in integral types for production drilling. And in feed lengths of 36" and 48".

IDEAL FOR OVERHEAD DRILLING — the well-balanced CP-34 Stoper gets more advance every raise round. Because it has just the right piston speed, foot-pound blow, rotating speed and feed pressure, it gets the most service and footage from Tungsten-Carbide bits.

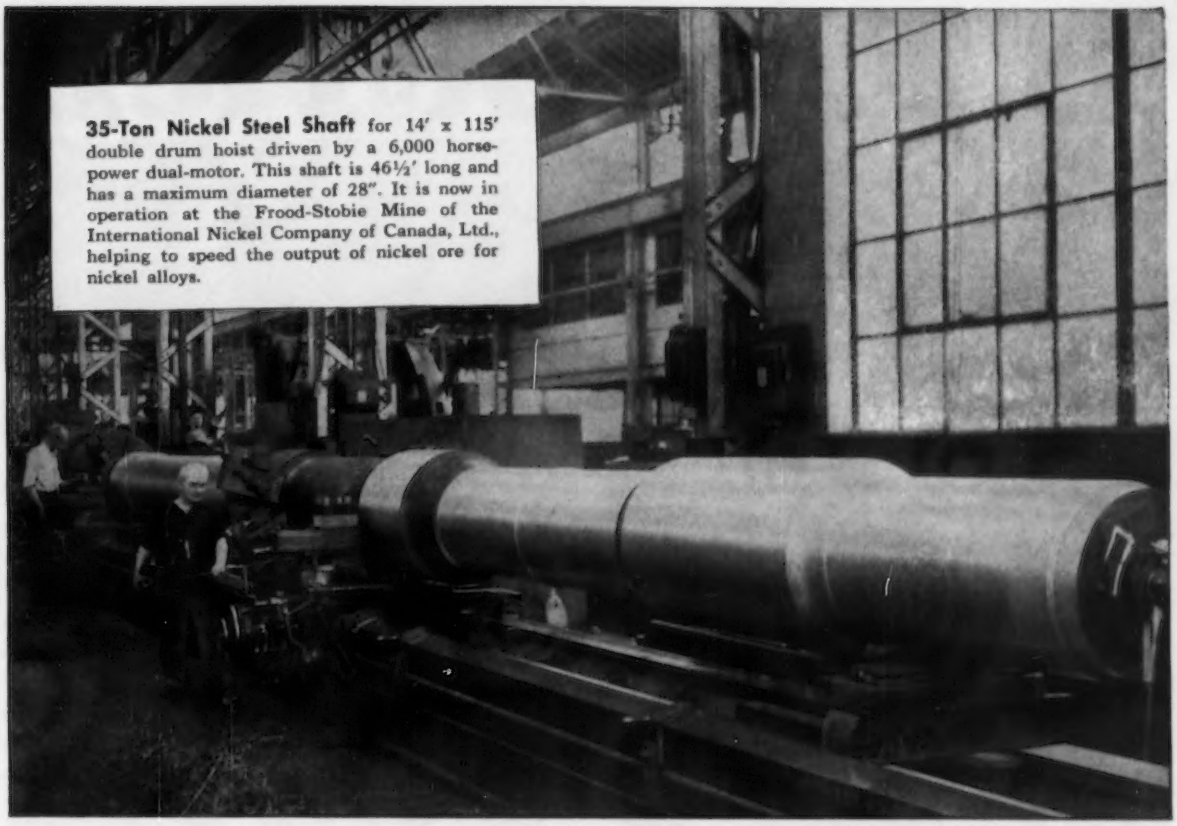


FOR FASTER TUNNEL DRIVING — the CP-5ON Drifter combines strong rotation and fast hitting action and correct foot-pound blow for maximum penetration with Tungsten-Carbide bits. And it's ideal when used with the CP Air Actuated G-600 Drill Jumbo.

Also Available. Skid Mounted Diamond Core Drills for Exploratory Drilling, and a complete line of pneumatic tools and portable or stationary air compressors.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



35-Ton Nickel Steel Shaft for 14' x 115' double drum hoist driven by a 6,000 horsepower dual-motor. This shaft is 46½' long and has a maximum diameter of 28". It is now in operation at the Frood-Stobie Mine of the International Nickel Company of Canada, Ltd., helping to speed the output of nickel ore for nickel alloys.

How nickel strengthened the shaft for

Canada's highest powered mine hoist

IN LARGE FORGINGS such as this giant shaft, high tensile and elastic properties do not come easily.

Liquid quenching of heavy forgings is usually impractical. Even when the shape is such that this treatment may be safely applied, the section sizes involved often restrict cooling to rates which render the quench ineffective.

Increased strength, hardness, toughness and other mechanical properties in a large forging depend to a great extent upon selection of alloy content.

Accordingly, to attain maximum strength and toughness in the shaft of Canada's highest powered mine hoist, at our own Frood-Stobie mine, we specified a shaft forged of 3½% nickel steel . . .

Because nickel, either alone or in combination with other alloying elements, provides a number of advantages.

For one thing, it has a strengthening effect on ferrite . . independent of carbon content or heat treatment of the steel.

For another, it lowers the rate and temperature of the upper transformation, thus inducing better response to the necessarily milder heat treatments used. And it reduces grain growth.

Whenever you face a metal problem, let us help you make a selection that will meet your particular fabricating and service requirements. Send us details of your applications, for our suggestions.

INCO
TRADE MARK

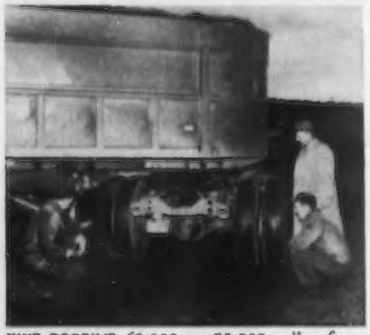
Double Drum Hoist for the Frood-Stobie Mine, during course of shop erection by the builder, The John Bertram & Sons Co., Ltd., Dundas, Ontario. Spiders that support the steel shell of the hoisting drum were cast in an iron containing 1½% nickel . . . to assure adequate strength in the 74,600-pound drum-spider assembly. This hoist, operated by push button control from a station far underground, can lift skips containing 15 tons of nickel-copper ore, at an average rate of 14,000 tons daily.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

B.F.Goodrich

Rock mover gets 6,000 hours of service, 2 recaps from All-Nylon tires

J. Robert Bazley, Inc., operates 260 units throughout central and eastern Pennsylvania. This Pottsville company moves rock, gravel and earth, constructs highways, does contracting and mechanical engineering, in addition to coal hauling. Trucks work as many as 21 hours a day carrying loads averaging 20 tons over rock and coal-strewn roads.



"WE RECEIVE 65,000 to 85,000 miles from *all-nylon* B. F. Goodrich Traction Express tires on the same jobs where 40,000 miles was considered excellent from other tires," says Mark Yoder, whose company hauls coal over Pennsylvania and New Jersey highways.

B. F. Goodrich *all-nylon* tires have worked 3,000 hours on the original tread, then put in an additional 3,000 hours on 2 recaps! Says Vice President James Bazley: "B. F. Goodrich *all-nylon* tires give us more recaps per tire and keep down-time and costs appreciably lower."

Why All-Nylon tires cut costs

Nylon is stronger than ordinary cord materials, withstands double the impact and resists heat blowouts and flex breaks. *All-nylon* Universal (above) or Traction Express (left) tire bodies outwear their extra-thick treads, can still be recapped over and over! No wonder B. F. Goodrich *all-nylon* tires will give you longer service at lower cost.

Your B. F. Goodrich retailer has a complete line of *all-nylon* or rayon (smaller sizes and lower prices) tires for your mining work. Look for his address under Tires in the Yellow Pages of your phone book. See him today, or write *The B. F. Goodrich Co., Tire & Equipment Division, Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

In Skid-Mounted Portable Air Compressors

In Wagon Drills for Surface Drilling

When it's a long ways into town . . . Uranium miners choose Gardner-Denver dependability

In Hand Held Rock Drills

In Deep Hole Drills for Test or Blast Holes

In Water-Saving Stationary Compressors

Write for descriptive bulletins on products illustrated and on other products for uranium mining.

GARDNER-DENVER Since 1859

KELLER TOOLS

GARDNER-DENVER

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada) Ltd., 14 Curity Avenue, Toronto 16, Ontario

FLEXIDYNE

THE DRY FLUID DRIVE

DODGE of Mishawaka Announces An Entirely New Development in Industrial Power Drives that Promises to Revolutionize Drive Performance! Every Design Engineer and Plant Operating Man in America Will Want the Following Information.

Here are the facts on how easily Flexidyne handles difficult starting problems, and gives a *new* kind of protection against shock and overloads.

While new in the United States, this drive has already been proved in thousands of installations in Europe. Dodge has redesigned it to American standards and now makes its dramatic advantages available to all industry.

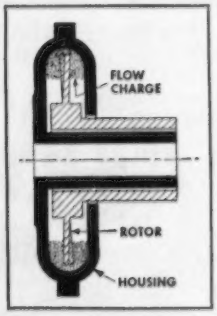
Flexidyne is a *dry fluid drive.* Its advantages over any other fluid-type drive are based on the fact that at normal operating conditions it *does not slip.*

WHAT IT IS

The Flexidyne Drive is made up of a housing, inside of which a rotor is free to turn concentrically. Between the two are fine particles of spherical steel shot, called the "flow charge," which acts very much like a fluid. The flow charge transmits power from housing to rotor.

This flow charge is easy to seal in, has a high density and can stand relatively high temperatures. The use of this flow charge makes possible a design that is simple, compact, economical, and gives outstanding new and different operating characteristics.

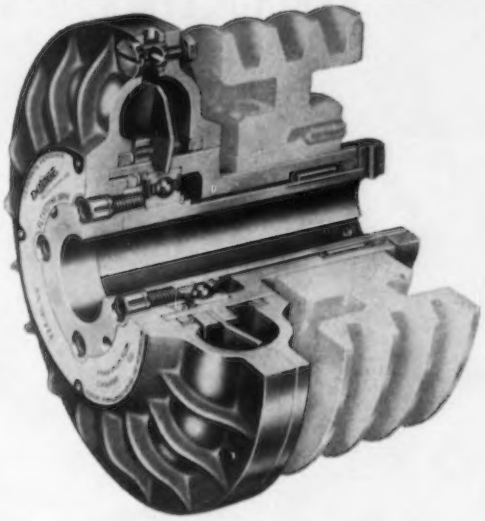
HOW IT WORKS



1. The motor is connected to the housing, and starts it turning at no load.

2. The flow charge is thrown to the circumference of the housing, is compressed by centrifugal force, and revolves with the housing.

3. The rotor, connected to the load, is started and accelerated by the friction and wedging action of the revolving flow charge.



FLEXIDYNE DRIVE (with Taper-Lock Sheave in phantom).

4. Rotor and housing reach identical speeds—the Flexidyne operates with ZERO SLIPPAGE between motor and load at normal running speeds.

5. Before overloads cause damage, the Flexidyne rotor slips relative to the housing, overcoming the friction and wedging action of the flow charge. A thermal switch (optional) automatically cuts the electrical circuit if an overload persists.

6. The amount of the flow charge determines the torque capacity.

WHAT IT DOES

The Flexidyne gives you the *exact* starting torque you need, for anything from the smoothest to the fastest start. Once the load reaches normal speed, there is zero slip, giving 100% efficiency. Also, it provides *accurate* overload protection, as it can be set to slip at any desired load. During starting and overload periods the current draw is at a minimum because with the standard Flexidyne setting the motor is never pulled down to less than 90% of synchronous speed.

All this is due to Flexidyne's completely new principle, which produces *constant torque* for a given input speed, regardless of the percentage of slip between the rotor and housing (which occurs only during starting or overload).

The Flexidyne is simple to select *off the shelf.* Each size has a standard horsepower rating and yet it is only a matter of minutes to vary the flow charge to give you your own *tailor-made torque* to suit the job.

With Flexidyne you get *uniform* performance regardless of changes in the surrounding temperature.

The Flexidyne has very long life and practically negligible maintenance. *Its simplicity guarantees its dependability.* Gas and diesel engines also benefit from all Flexidyne advantages.

Aside from Flexidyne's low first cost, low maintenance, and top efficiency, it permits the use of smaller, cheaper motors and controls with greatly reduced current demands and improved power factor. Its *smoother* starts and *gentler* overload protection avoid breakage and reduce maintenance on drives, gears, bearings and driven machinery.

FLEXIDYNE COUPLINGS

Two lines will be available—*Flexidyne Drives,* for convenient mounting directly on motor shafts and adapted for Dodge Taper-Lock Sheaves, and *Flexidyne Couplings* with Taper-Lock Bushings, for straight line drives. Several thousands of these units of French design, in capacities ranging from fractional to thousands of horsepower, are now in use in Europe. Dodge will first offer — from stock — four sizes rated at 3 to 30 hp at 1800 rpm. Other sizes will follow.

Write now for special bulletin, delivery dates and application information.

DODGE MANUFACTURING CORPORATION
3100 UNION STREET, MISHAWAKA, INDIANA

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

DODGE
of Mishawaka, Ind.

LIMA Type 1201 shovel and Type 1201 dragline stripping coal. The Type 1201 is equipped with a 24'-6" boom, 18'-0" dipper handle and 3½ cu. yd. dipper. The Type 1201 has gained world-wide recognition for its dependable performance and big output at low operation and maintenance cost.

LIMA'S fast service cuts costly downtime

From coast-to-coast Lima service engineers, warehouses and distributors are prepared to give you that extra-fast service or parts delivery which can make all the difference between continuous, profitable production and high-cost idleness of equipment.

When you buy a LIMA you can depend on long, trouble-free service, thanks to those extra quality features built into every LIMA. But if trouble happens and you need help, you get it from Lima . . . fast!

COMPARE QUALITY! No other machine gives you as much as LIMA!

1. Piston ring type dirt seal rings and retainers in crawler rollers.
2. Moving parts are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation.
4. Anti-friction bearings at every vital bearing point.
5. Big capacity drums and sheaves are easy on cables.
6. Propel and swing gears and power take-off are enclosed in a sealed oil bath.
7. Torque converter (optional on certain types).
8. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts to keep your LIMA on the job continuously.

COMPARE and you'll specify LIMA for shovels (to 6 yds.), cranes (to 110 tons) and draglines (variable). Smaller capacities available on rubber.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

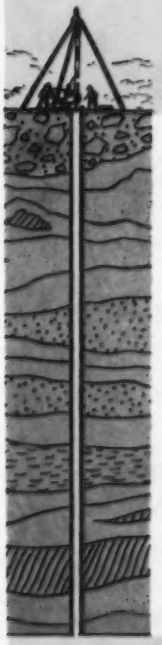
BALDWIN BLH LIMA-HAMILTON

LIMA SHOVELS · CRANES · DRAGLINES · PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division · LIMA · OHIO · U. S. A.

You'll Get Greater Footage at Lower Cost with Sprague & Henwood's ORIENTED DIAMOND BITS



AFTER extensive comparative tests, conducted in cooperation with the U. S. Bureau of Mines, had PROVED that drill diamonds cut faster and last longer when "oriented" in the matrix with their hardest edge or "vector" toward the work, we decided that random setting was obsolete. Since then we have standardized on oriented diamond bits and have produced THOUSANDS—in a wide variety of types and sizes, with both cast- and powdered-metal matrices—to meet every diamond drilling requirement.

For either core drilling, or any type of non-core drilling, we believe these to be the most efficient and economical diamond bits ever produced and invite inquiries on that basis. Bulletin No. 320 illustrates all types and gives complete working data. Write for a free copy and tell us about your drilling conditions. Our experienced executives welcome opportunities to make money-saving suggestions without charge or obligation.

WORLD-WIDE CONTRACT DRILLING

For more than seventy years Sprague & Henwood, Inc. has been a leader in the field of Contract Diamond Drilling. During this long period of time our crews have completed thousands of contracts successfully, under every conceivable operating condition, in almost every part of the world. Today we have a large force of expert operators and an ample supply of modern equipment, so that we can undertake practically any job, anywhere, on short notice. Estimates submitted promptly on request.

SPRAGUE & HENWOOD, INC., SCRANTON 2, PA.

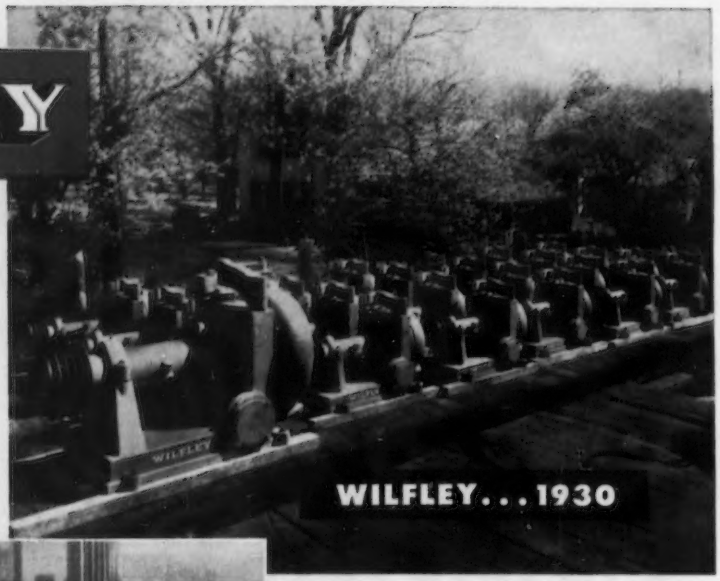
NEW YORK • PHILADELPHIA • PITTSBURGH • GRAND JUNCTION, COLO. • BUCHANS, NEWFOUNDLAND
EXPORT REPRESENTATIVE: PHILIPS EXPORT CO., 100 EAST 42nd ST., NEW YORK 17, N. Y.

Leading Manufacturers, also, of High-Speed Diamond Core Drilling Machines and a complete line of Improved Accessory Equipment for Diamond Drilling and Soil Sampling. Write for illustrated catalogues containing complete specifications and all necessary working data on:

Auger Bits, all types
Bails, lifting
Ball-Bearing Waterswivels
Bits, Diamond
Bits, Blank
Bits, Chopping
Bushings, Rod & Casing
Casing, Flush Coupled
Casing Tape
Clinometers
Corebarrels, all types
Corebarrel Taps
Core Lifters
Couplings, Rod
Derrick Sheaves
Drill Rods
Drilling Machines
Drive Hammers
Drive Heads
Drive Pipe
Drive Pipe Couplings
Drive Shoes
Extensions, Core Barrel
Fishing Tools
Fishtail Bits
Flush Coupled Casing
Foot Safety Clamps
Hoisting Hooks
Hoisting Plugs
Hoisting Plug Reducers
Hoisting Rings
Hose, Waterswivel
Hose, Suction
Jar Lengths
Jaws, Safety Clamp
Lifters, Rod
Mud Bits
Pilot Reamers
Plugs, Hoisting
Pressure Testers
Protecters, Casing
Reamer Shells
Reducers, Rod
Rods, Drill
Rod Couplings
Rod Taps
Rose Bits
Safety Clamps
Sawtooth Bits
Sheave Wheels
Soil Samplers
Subs
Taps, Fishing
Testers, Sample
Testers, Pressure
Wash Plugs
Water Swivels

WILFLEY

...Advances with the Mineral Industry



Progress in Low-Cost Pumping

Top photo (right) shows part of a large shipment of Wilfley Model "C" Sand Pumps ready for delivery to a large nickel producer.

25 years later this same company still depends on Wilfley for low-cost pumping. Shown in bottom photo is part of a large shipment of Wilfley's new Model "K" pumps on their way to the same customer.

The name Wilfley means continued progress in efficient, economical pumping. Wilfley keeps pace with mineral production throughout the world by designing and manufacturing pumps that definitely deliver cost-saving performance on every application.

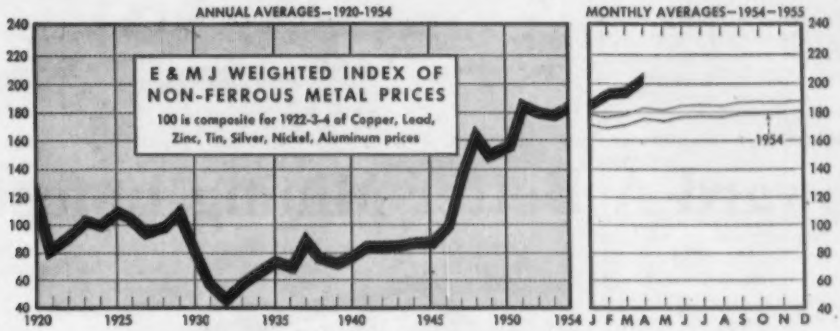
Write or wire for complete details on Wilfley Pumps

Wilfley Acid Pump
"COMPANIONS IN ECONOMICAL OPERATION"
Wilfley Sand Pump

A. R. WILFLEY and SONS, INC. Denver, Colorado, U. S. A.
New York Office: 1775 Broadway, New York City

OUTLOOK

PRICES



MARKETS

Copper at 36c and zinc at 12c boosted *E&MJ*'s price index by 8.97 points to 207.34 for April, the highest on record. A year ago it was 183.27.

Except for definite easing in copper prices outside the U. S., metal markets were remarkably stable throughout the month. World consumption of copper, lead and zinc hit record peaks in the Jan.-Apr. period, and promise to hover near peak levels for most of 1955.

Scarcity of copper was eased in part by government release of copper not actually locked up in stockpiles. U. S. released 17,500 tons, and Britain, 65,000 tons. With mine output increasing, only strikes can tighten up supplies.

●

LABOR

Work stoppages were averted at Anaconda's mines in Chile by wage hikes at Chuquicamata and Potrerillos. Rhodesian miners are out for more pay. Mine Mill and Smelter Workers have come out for wage hikes and other benefits at large U. S. copper properties.

United Steelworkers (CIO) are campaigning to organize the Colorado Plateau uranium camps. Talk about $17-$20 basic pay rates plus benefits is being bandied about. AFL and UMW District 50 is also active in the area, but MMSW hasn't shown its hand so far.

●

AT HOME

Railroads are petitioning Interstate Commerce Commission to make permanent the temporary 12 to 15% freight rate increases granted in 1952 and due to expire at the end of 1955. Indications are that the mining industry will not take this one sitting down, and will request an ICC hearing.

With steel, rayon, aluminum, housing starts, automobile output, etc. all pushing record-breaking peaks, the big question is: How long will it last? Looking ahead for the rest of the year, McGraw-Hill Economics Department capital expenditure surveys indicate that seasonal dips expected for automobile output and building starts will be offset by industry's scheduled plans to buy machinery and capital goods later in the year. The persistent foreign industrial boom also dims any nearby economic plunge.

Upward pressures on prices by wage increases and other factors will be disciplined by stiffening competition and high industrial capacities.

Rutile, most favored source of titanium metal was 5 to 6c per lb a year ago. Today it's 9 to 9¼c per lb.

●

ABROAD

Krupp's Widia plant at Essen, will start producing titanium this spring at rate of about 3 tons per month.

High copper output will increase Chile's foreign exchange income to $179-million for 1955, $55-million higher than expected.

An Anglo-Turkish barter deal calls for delivery of 3,000 tons of Turkish copper in partial settlement of old trade debts.

Toward A Better Mining Industry

"U_3O_8—FORMULA FOR PROFITS" published by *Engineering & Mining Journal,* September 1954, has been accorded the 1954 Industrial Marketing highest award for "the best single article serving an industrial publication's field."

This article would not have been possible without the generous cooperation given *E&MJ*'s staff by members of the Atomic Energy Commission, large and small uranium mining companies, Western mining associations, prospectors, consulting mining engineers and geologists, and equipment manufacturers. The wealth of basic reliable information packed into this article reflected interviews and contributions by such mining men on the firing line of the uranium production front as AEC's Sheldon Wimpfen and his Grand Junction staff members including E. H. Crabtree, E. R. Gordon, Charles Tonry, E. A. Youngberg, Q. L. Brewer, R. J. Wright, W. L. Lennemann and P. J. Simmons; R. S. Foote of the AEC Geophysical Branch; veteran uranium producers including Denny Viles of VCA, Blair Burwell and Ray Sullivan of Minerals Engineering Co.; successful prospectors and developers including Vernon Pick and Charles Steen; mine superintendents John Herndon, Virgil Bilyou, and Roy Tyler; mill superintendents Charles Lindberg, W. J. Roberts and Helmar Johnson; and Anaconda's uranium project manager, Jack Knaebel.

The first-hand experience and advice of these men and others made it possible to present an authoritative article bringing America's biggest mining boom into sharp perspective.

What purpose did it serve? Literally thousands of reprints were requested by prospectors, large and small mining companies, major oil companies now interested in uranium, large national investment houses studying uranium, legal firms, banks, state mining departments, libraries, schools, colleges, consultants, equipment manufacturers, etc.—all potentially important to our future domestic uranium production program.

In short, "U_3O_8—Formula for Profits" served as a medium to inform people outside the mining industry of the constructive things that mining men are doing today. Perhaps this opening wedge will point the way to other opportunities for establishing better public relations for the mining industry.

To the men in industry who contributed so much toward the usefulness of "U_3O_8—Formula for Profits" *E&MJ* expresses its sincere appreciation and thanks.

MARKETS—Trends and Prices

Demand for Metals at High Rate—U.K. Releases Copper to Ease Tension

DEMAND for major nonferrous metals continued at a lively pace throughout April. Back of the extraordinary demand that has been absorbing record peacetime tonnages for the last four months is the sustained high rate of activity in the construction, automobile, and durable goods industries. Higher prices have not stopped buyers, though tension over the supply situation eased as the month ended.

Despite higher prices paid outside of the U.S., copper managed to hold at 36c per pound. Zinc advanced one-half cent as consumers rushed into the market on a "tip" by a radio commentator. Lead sales were substantial at unchanged prices.

The E&MJ index of nonferrous metal prices advanced from 198.37 in March to 207.34 in April, a new all-time high, owing to higher monthly averages for copper and zinc. The operating rate of the steel industry as April ended was estimated at 96% of capacity, against 68.7% a year ago. The Federal Reserve Board's index of industrial production for March rose to 135% of the 1947-49 base period, and preliminary estimates for April indicate that it will rise to 136 or 137%.

Copper shortages were relieved by steps taken here and in the U.K. to release metal from governmental reserves other than stockpiled material. Early in the month consumers in the U.S. were assured by the Office of Defense Mobilization that 17,500 tons would be made available to ease the tension. On April 13, the British Board of Trade announced it will sell up to 45,000 tons of electrolytic copper over the remainder of the year. So far as practicable, it was said, the copper will be delivered and priced at an even rate. About a week later the Board released 20,000 tons of blister copper of the Rhodesian Selection Trust's own brands to the company.

Violent price changes occurred on the London Metal Exchange as a result of the British developments, with the trend downward from what consumers regarded as wholly unrealistic levels. In defending the wide fluctuations that reflected general confusion over the "unexpected" action by the Board of Trade, a spokesman for the Exchange said: "Every section of the trade suffers on such occasions, and the members of the London Metal Exchange hope that in any future disposals the Board of Trade will consider market stability as one of the cardinal factors affecting their deliberations." Copper released in the U.K. was metal that would come out of the government's residual trading stocks and not out of its strategic reserve or stockpile. (London quotations appear on page 71).

Production of copper is rising. Recent statistics indicate that combined U.S. and foreign output of crude, primary and secondary, totaled 243,714 tons in March, the highest monthly rate on record. Combined U.S. and foreign deliveries of refined copper totaled 234,350 tons, though not without some help from Government stocks in this country.

A summary of the February and March statistics of Copper Institute, in tons, follows:

United States

	(a) Feb.	Mar.
Production:		
Crude, primary	89,078	98,908
Crude, secondary	13,264	10,225
Totals	102,342	109,133
Refined copper	123,162	134,933
Deliveries, refined	(b)108,503	(b)130,586
Stocks, refined	44,579	46,091

Outside United States

	(a) Feb.	Mar.
Production:		
Crude, primary	114,260	134,262
Crude, secondary	208	319
Totals	114,468	134,581
Refined copper	89,661	101,825
Deliveries, refined	116,752	103,764
Stocks, refined	144,337	148,973

(a) Corrected. (b) Includes tonnages delivered from Government stocks; also includes imports of foreign copper for account of Copper Institute members or others.

Lead consumers absorbed large tonnages during April and surplus stocks were reduced to the extent that some producers are down to current output to take care of new business. This has greatly strengthened the position of lead, yet there was no move to raise the price here above the 15c basis. The Government was in the market for stockpile metal covering deliveries to be made up to June 15.

Defense Mobilizer Flemming remarked he will ask for advice shortly on the question of continuing domestic lead-zinc purchases for the stockpile. President Eisenhower last August said the Government "could" purchase up to 200,000 tons of lead and 300,000 tons of zinc for the stockpile in the fiscal year that ends June 30, 1955. The general firming up of prices and an expanding consumer demand makes it uncertain as to the extent that the Government is prepared to support these commodities after the current fiscal year ends.

Zinc encountered something really different in the way of a market stimulant. A radio commentator, on April 3, predicted that the price of zinc would rise. Producers thought little of this free advice until buyers began to come into the market from all sections of the country for heavy tonnages on the following day. London prices moved up. On April 5, St. Joe raised its selling basis one-half cent to 12c for Prime Western, East St. Louis. Other producers followed slowly, taking advantage of the boom in buying to book substantial tonnages at the old figure. This accounts for our low weighted average of 11.550c for April 5. On the following day all sales reported to *E&MJ* were at 12c. As in lead, the Government asked for offers of zinc for the stockpile.

Aluminum output in the U.S. in March was 130,272 tons, a new high. The recent cut-back in the Government's take for the stockpile has reduced but not eliminated the shortage. Prices of aluminum scrap have eased in some sections of the country. Secondary aluminum also eased though prices remain high compared with the primary product.

Nickel production in the Free World, which increased to 390-million pounds in 1954, is expected to rise to at least 450-million pounds by 1958, according to Dr. Thompson, chairman of International Nickel.

Tin quotations remained fairly stable despite delay over final action on the International Tin Agreement. With continued operation of the Texas City smelt-

Average Prices for April (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	35.700
Electrolytic, export, refinery	37.938
Lead:	
Common, New York	15.000
Common, St. Louis	14.800
Silver and sterling exchange:	
Silver, New York, per oz.	87.071
Silver, London, pence per oz.	75.711
Sterling Exchange, "Checks"	279.649
Zinc:	
Prime Western, East St. Louis	11.925
Prime Western, delivered (g)	12.425
Tin:	
New York Straits	91.413
New York, 99% min. (e)	90.413
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$315.846
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$78.500
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	23.200
Magnesium, ingot	28.500
Nickel (f)	64.500

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

er assured for another year, ore contracts with Bolivia and other sources of supply undoubtedly will be renewed. Uncertainty over Indonesia's intentions in reference to the control plan were disturbing to consumers as well as other producing countries.

Quicksilver was easier, with domestic and European metal available at $315 per flask, nearby delivery, and Mexican for May shipment at $310. Demand was slow.

Manganese ore is being consumed at a good rate, following the trend in steel. With freights higher, sellers entertained stronger ideas. Large consumers moved slowly in making new commitments.

Tungsten in the world market was firmer on reduced offerings of ore of good quality.

"Free" Gold Market

Gold trading volume in the "free" market increased by 25% in March. The Soviets, for the first time since October 1954, sold 1-million ounces in Western Europe. Prices in European markets were steady. All Asiatic centers were strong; Bombay rose to its highest level since 1951. Pick's World Currency Report quotes on "free" gold, per fine oz, as follows:

	COINS		BARS (12.5 kg)	
	Mar. 31	Apr. 30	Mar. 31	Apr. 30
NEW YORK, transit	....	....	$35.10	$35.10
MANILA	$40.00	$39.75	37.25	37.50
HONG KONG	39.85	39.75	37.95	38.00
BOMBAY	53.00	53.30	52.50	53.75
TANGIER	39.25	39.25	35.05	35.05
BEYROUTH	40.00	39.50	35.20	35.20
PARIS	39.50	39.80	35.80	35.95
BUENOS AIRES	42.50	44.00	38.75	38.70

Note: All prices are computed at the free or black market value of the U.S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

April 1955	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	35.700	38.525	90.625	15.000	14.800	12.000	11.500
2	No Market	38.050	90.625	15.000	14.800	12.000	11.500
4	35.700	40.100	90.750	15.000	14.800	12.000	11.500
5	35.700	40.025	91.000	15.000	14.800	12.050	11.550
6	35.700	39.275	91.250	15.000	14.800	12.500	12.000
7	35.700	40.100	91.500	15.000	14.800	12.500	12.000
8	35.700	38.650	91.500	15.000	14.800	12.500	12.000
9	No Market	38.650	91.500	15.000	14.800	12.500	12.000
11	35.700	37.325	91.500	15.000	14.800	12.500	12.000
12	35.700	37.925	91.250	15.000	14.800	12.500	12.000
13	35.700	37.100	91.375	15.000	14.800	12.500	12.000
14	35.700	37.450	91.375	15.000	14.800	12.500	12.000
15	35.700	38.425	91.750	15.000	14.800	12.500	12.000
16	No Market	37.175	91.750	15.000	14.800	12.500	12.000
18	35.700	38.050	92.125	15.000	14.800	12.500	12.000
19	35.700	37.800	92.125	15.000	14.800	12.500	12.000
20	35.700	37.750	91.875	15.000	14.800	12.500	12.000
21	35.700	37.225	91.625	15.000	14.800	12.500	12.000
22	35.700	38.875	91.625	15.000	14.800	12.500	12.000
23	No Market	38.875	91.625	15.000	14.800	12.500	12.000
25	35.700	37.075	91.500	15.000	14.800	12.500	12.000
26	35.700	36.350	91.375	15.000	14.800	12.500	12.000
27	35.700	36.500	91.375	15.000	14.800	12.500	12.000
28	35.700	36.525	91.250	15.000	14.800	12.500	12.000
29	35.700	36.400	91.250	15.000	14.800	12.500	12.000
30	No Market	36.175	91.250	15.000	14.800	12.500	12.000
AVERAGES FOR MONTH							
April	35.700	37.938	91.413	15.000	14.800	12.425	11.925
AVERAGES FOR WEEK							
April							
6	35.700	39.158	90.917	15.000	14.800	12.092	11.592
13	35.700	38.292	91.438	15.000	14.800	12.500	12.000
20	35.700	37.775	91.833	15.000	14.800	12.500	12.000
27	35.700	37.483	91.521	15.000	14.800	12.500	12.000
CALENDAR WEEK AVERAGES							
April							
2	34.380	38.279	91.042	15.000	14.800	12.000	11.500
9	35.700	39.467	91.250	15.000	14.800	12.342	11.842
16	35.700	37.567	91.500	15.000	14.800	12.500	12.000
23	35.700	38.096	91.833	15.000	14.800	12.500	12.000
30	35.700	36.504	91.333	15.000	14.800	12.500	12.000

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

April 1955	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
1	279.3125	88.500	77.000d.	251s. 1½d.	$35.00
2	(e)	(e)	(e)	(e)	35.00
4	279.4687	87.000	77.000d.	251s. 0d.	35.00
5	279.4642	87.000	75.750d.	250s. 9½d.	35.00
6	279.4375	87.000	75.750d.	250s. 10½d.	35.00
7	279.4687	87.000	75.750d.	250s. 10d.	35.00
8	279.5000	87.000	Holiday	Holiday	35.00
9	(e)	(e)	(e)	(e)	35.00
11	279.5312	87.000	Holiday	Holiday	35.00
12	279.7053	87.000	75.750d.	250s. 8½d.	35.00
13	279.7500	87.000	75.500d.	250s. 7d.	35.00
14	279.7410	87.000	75.500d.	250s. 7d.	35.00
15	279.7812	87.000	75.500d.	250s. 6½d.	35.00
16	(e)	(e)	(e)	(e)	35.00
18	279.6562	87.000	75.500d.	250s. 7d.	35.00
19	279.7187	87.000	75.500d.	250s. 8d.	35.00
20	279.6562	87.000	75.500d.	250s. 7d.	35.00
21	279.6875	87.000	75.500d.	250s. 7½d.	35.00
22	279.6562	87.000	75.500d.	250s. 7½d.	35.00
23	(e)	(e)	(e)	(e)	35.00
25	279.7232	87.000	75.500d.	250s. 7½d.	35.00
26	279.8750	87.000	75.500d.	250s. 6½d.	35.00
27	279.9062	87.000	75.500d.	250s. 5½d.	35.00
28	279.8750	87.000	75.500d.	250s. 4½d.	35.00
29	279.7187	87.000	75.500d.	250s. 6½d.	35.00
30	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
April	279.649	87.071	75.711	—	35.00
AVERAGES FOR WEEK					
April					
6	279.397	87.600	—	—	—
13	279.591	87.000	—	—	—
20	279.711	87.000	—	—	—
27	279.770	87.000	—	—	—

Calendar Week Averages: New York Silver: April 2nd, 88.500; 9th, 87.000; 16th, 87.000; 23rd, 87.000; 30th, 87.000.

(e) No Market (Saturday).

London Metal Exchange Quotations

Prices are for the official a.m. session in pounds sterling per long ton.
Copper basis is wirebars; lead 99.97%; zinc 98%; tin minimum 99.75%.

	COPPER				LEAD				ZINC				TIN			
	Cash		3 Mo.		Current Month		3 Mo.		Current Month		3 Mo.		Cash		3 Mo.	
Apr.	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1	360	361	352½	353	104¼	104½	103½	103¾	88½	88¾	87¼	87¾	714½	715	715	715½
4	352	352½	345½	346	104	104¼	103¼	103½	88	88¼	87	87¼	711	712	713	714
5	351½	352	344	345	104¼	104½	103½	103¾	89¼	89½	88¼	88½	712	713	714	715
6	351	352	344	345	104¾	105	103¾	104¼	89½	89¾	88½	89	717	717½	718	718½
7	340	341	332	333	104¼	104½	103¾	104	89¼	89½	88¼	88½	717	717½	718	719
8	Holiday															
11	Holiday															
12	339	339½	331½	332	104½	104¾	103¾	104	89¼	89½	88	88¼	716	717	716½	717
13	303	304	299	300	104½	104¾	104½	104½	89½	89¾	88	88¼	714½	715½	715½	716
14	305	305½	300	300½	104½	104¾	104¼	104½	90	90¼	88	88¼	715½	716	716	717
15	316	317	309	310	105	105¼	104½	104¾	89¼	89½	87¾	88	717½	718½	718½	719
18	335	336	325	326	105¾	106	105¼	105¾	89¾	90	88¼	88¾	720½	721	721	721½
19	334	335	325	325½	105½	105¾	105¼	105½	89¼	89½	88	88¼	722½	723	723	723½
20	328	329	318½	319	104¾	105	104¾	105	89	89½	87¾	88	717½	718½	718½	719
21	321½	322½	310	311	104½	104¾	104¼	104½	89	89¼	87¾	88	717½	719	718½	719
22	322½	325	312	313	104¼	104½	104¼	104½	89¼	89½	87¾	88	716½	717	717½	718½
25	316½	317½	307	307½	104¼	104¼	104	104¼	88¾	89	87½	87¾	715	715½	716	717
26	306	307	295½	296	103	103¼	103	103¼	87¾	88	87	87¼	715	716	715	716
27	318	320	307	308	103½	103¾	103¾	104	88	88¼	87¼	87½	715½	716	716½	717
28	313½	314	301	302	103½	103¾	103½	103¾	88	88¼	87	87¼	715	715½	715	716
29	310	311	299	299½	103¾	104	103½	103¾	88½	88¾	87½	87¾	713	713½	715	716

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

April 30, 1955

Aluminum ingot, 99 plus percent, lb.			23.2¢
Antimony, spot, lb., less than carload, in cases			31.97¢
In bulk, carload lots, f.o.b. Laredo			28.50¢
Bismuth, ton lots, lbs.			$2.25
Cadmium, commercial sticks, delivered, lb.			$1.70
Calcium, lb., ton lots, 98 percent, cast			$2.05
Chromium, 97 percent grade, lb., contract			$1.18
Cobalt, 9 to 99 percent, per lb.			$2.60
Germanium, lb.			$295.00
Indium, troy oz.			$2.25
Lithium, lb., 98 percent	$11.00	@	$14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)			64½¢
Magnesium, 99.8 percent, carloads, lb., producer's plants, Freeport, Texas			28½¢
Palladium, troy oz.	$17	@	$19
Platinum (wholesale lots) troy oz.	$76.00	@	$79.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$315	@	$318
Selenium, 99 plus percent, lb.	(b)$6.00	@	$7.25
Silicon, minimum 97 percent, carloads, lb.			18¢
Tellurium, lb.			$1.75
Thallium, 100 lb. or more, lb.			$12.50
Titanium, 99.3 plus, grade A, max. 3% iron, lb.			(c) $3.95

(a) Includes U. S. duty. (b) Depending on quantity. (c) Effective April 1, 1955.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$38.00	@	$40.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$22.00	@	$23.00
48% Cr_2O_3 3 to 1 ratio	$43.00	@	$46.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$10.50
Mesabi bessemer			$10.25
Mesabi, non-bessemer			$10.10
Lead (Galena), 80 percent, Joplin, Mo., ton			$187.85
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 86 @ 88¢ c.i.f. U. S. ports, duty extra. Long-term contract nominal at 86 @ 88¢ c.i.f. duty extra.			
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines			$1.05
Columbium-Tantalum, per lb., combined oxides			$3.40
Tungsten Ore, per unit of WO_3:			
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$30.00	@	$31.00
Domestic, scheelite, 60 percent f.o.b. mill			$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton			$72.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96	@	$1.97½
Copper Sulphate, 100 lb.			$12.25
Germanium Oxide, lb.			$142.00
Molybdic trioxide, technical, per lb. of Mo	$1.24	@	$1.25

ALLOYS

Ferrochrome 65 to 69 percent, per lb. of Cr. contained			24¾¢
Ferromanganese, 74-76%, net ton, seaboard			$190
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.49	@	$1.57
Ferrosilicon, 50 percent per lb. of contained Si			12¢
Ferrotungsten, 72 to 82 percent, lb. of W contained			$3.38
Ferrovanadium, per lb. of V delivered	$3.00	@	$3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts			11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade			$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$960	@	$1,500
Crude No. 2	$595	@	$900
Spinning fibers	$321	@	$514
Shingle fibers	$150	@	$200
Paper stock	$109	@	$137
Waste			$77
Shorts	$35	@	$70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):			
Spinning fiber, 3-K			$460
Shingle fiber, 4-K			$185
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$279.50	@	$302.00
Shingle stock	$135.00	@	$162.00
Paper stock	$81.50	@	$115.00
Waste, stucco or plaster			$71.40
Refuse or Shorts	$34.00	@	$63.00
Barytes f.o.b. cars:			
Georgia, crude, per ton			$15.00
Missouri, 94 percent $BaSO_4$, per short ton			$13.25
Bauxite, long ton, f.o.b. point of shipment:			
Domestic crude, 50 to 52 percent (not dried)	(a) $5.00	@	$5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50	@	$9.05
Domestic, abrasive, 80 to 84 percent	(a) $18.00	@	$18.50
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.25
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$29.00	@	$30.00
60% effective CaF_2	$26.00	@	$27.00
Acid 97% concentrate, bulk, ton			$47.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢ per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢ to 85¢; 2 x 2 inch, $1.10 to $160; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, Texas, mines, long ton	$25.50	@	$27.50
Talc, f.o.b. works, ton			
New York, purified	$18.50	@	$20.00
Vermont, extra white			$13.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$30.00

(a) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$56.00
Steel f.o.b. Pittsburgh, billets, net ton			$64.00
Structural shapes, Pa., Ala. etc., 100 lb.			$4.25

Companies Announce '54 Progress

Annual Reports Feature New Mines, Increased Reserves, Improved Research and Diversification of Interest

INCREASED EXPLORATION, test drilling of new orebodies and plant expansion highlight the operation of mining companies in the U. S. and abroad, according to annual reports published in the past several weeks. Following are digests of some of those received by *E&MJ*. Other reports will be digested in next month's issue.

Anaconda Copper Mining Co. An extensive shallow, low-grade deposit near Greater Butte was tested by 46,550 ft of churn drilling during 1954, and further drilling was planned for 1955. Surface stripping was expected to start in April. Sufficient work has been done to indicate a potential ore reserve of approximately 100-million tons.

Additional pots will be installed at Anaconda Aluminum's Columbia Falls, Mont. plant, upping capacity from 52,000 to 60,000 per year. Expenditures to end of December 1954 were $47-million plus.

"In a general review of uranium in 1954, the AEC has announced that the ore reserves of 'Anaconda's Jackpile mine, east of Grants, N. M., reached the several-million-ton class.' "

Production from the Skyrme open pit, an easterly extension of one of the Kelley ore zones, was conducted during late 1954, reaching approximately 2,000 tpd of ore.

Miami Copper Co. Production from Castle Dome Copper Co. Inc. was limited to recovery of copper through iron precipitation methods of the solutions draining from the mine waste dumps. Total Miami Copper production was 44,940,161 lb copper (6,884,208 from copper solution), with 23% coming from the low-grade orebody. Estimated reserves at the Miami mine are over 24-million tons.

Full production was attained at Copper Cities in November 1954. Final tally was 996,160 tons mined and concentrated with average content of 0.783% copper. Reserves are estimated at nearly 33-million tons.

Scintillation counter surveys adjacent to Globe-Miami district resulted in Miami's acquisition of 6,000 claims on public lands open for mineral location. Drilling to end of 1954 showed widespread presence of uranium minerals but, "as yet" no economic concentrations.

Cerro de Pasco Corp. Refined copper production was up 14%, reflecting full year's operation of the copper section of concentrator at CdeP. San Cristobal mine, near La Oroya, reopened.

Bunker Hill & Sullivan Mining & Concentrating Co. New charge preparation facilities permitted record smelter production of 84,591 tons lead and 17,155 zinc with only one blast furnace operating. Previous highs had been obtained with two furnaces. Ore reserves were upped to 2.5-million plus and new Shea orebody promises to add "very substantially."

American Zinc, Lead and Smelting Co. Sinking of shaft on the Emert property is expected to open mine which will produce 500 tpd ore in 1956.

Tennessee reserves at year end were 1,946,000 tons of 60% concentrates. Tons ore mined was 1,916,058; milled 1,853,654; tons zinc and lead concentrate produced 67,230.

American Zinc Co. of Tennessee will share with DMEA cost of drilling 7,800 acres between the South Friends Station and Grasselli property. Project will run two years and involve 450,000 ft drilled.

Climax Molybdenum Co. Company commenced $1.5-million expansion of uranium mill at Grand Junction (Climax Uranium Co.), and completed expansion at Climax, Colo., upping molybdenum production plus 5-million lb. Total molybdenum production was 42,544,795 lb; tungsten, 632,000 lb.

Climax acquired half interest in St. Anthony Uranium Corp., which holds a lease on approximately 21,000 acres near Anaconda's properties in Valencia County, N. M.

Atlas Corp. Approximately 600,000 tons commercial grade uranium have been established at Hidden Splendor mine, with total extent still unknown. Large-scale mining will begin in a few months.

Calumet & Hecla, Inc. Average grade of ore from seven operating mines was 16.96 lb per ton, under 1953. Reserves are near exhaustion in several of the mines, but closing should coincide with opening of Osceola shafts, where 3,000 tpd will maintain present levels. Completion of Osceola project (total cost estimate: $8,700,000) is expected in mid-1955. Lowering of water level 2,020 ft vertically at the end of 1954 represented removal of about 70% of the total water to be pumped.

Phelps Dodge Corp. Mines produced 222,000 tons of copper in 1954, nearly 27% of total domestic production and about 9.5% of world production. Company's open pit mines made up 83% of the total.

Lavender Pit began producing following removal of some 42-million tons of waste overburden. Laurel Hill (N. Y.) and El Paso refineries were expanded. Drilling continued at Tyrone, N. M., to develop "a large but low-grade orebody. Results continue to be encouraging."

Freeport Sulphur Co. Chacahoula mine, newest of Freeport's producers, began operation March 10, 1955. Largest, in terms of tonnage, was Grande Ecaille. Hoskins mine produced 170,000 tons in '54, but is now close to exhaustion. Overall production by Freeport in 1954 for the first time exceeded 2-million tons, made possible by successful operation of Garden Island Bay (500,000 tons in 1954).

National Potash (50% Freeport, 50% Pittsburgh Consolidation Coal Co.) will sink shafts and build a mill near Carlsbad, N. M., with operation target date in 1957.

Kennecott Copper Corp. "At the new research center, there was brought to a successful conclusion the pilot plant testing of a method of increasing copper recovery from the refractory ores of our properties in Arizona and New Mexico" —Charles Cox, president. Company properties were operating at capacity at year's end.

Mineral Exploration Corp. Ltd. Area of Cape Breton was sampled in 34 pits, giving average 4.14% zinc plus values in germanium and cadmium. Estimates elsewhere have shown zinc averages of 5% and 13%, germanium content of approximately 0.031 lb per ton and approximately 0.47 lb per ton cadmium. At the northern end of the area, one diamond drill intersection showed 0.22 lb germanium to the ton, taken from seven samples.

Iron Ore Imports At New Peak

U. S. IMPORTS OF IRON ORE last year were a record-breaking 17.7-million net tons, 42% greater than the previous record, set in 1953, reports American Iron and Steel Institute.

Iron ore properties in Venezuela (5.8-million tons), Canada (plus 4-million) and Liberia (857,000) supplied 60% of the total 1954 imports, all developed largely by steel companies in the U. S. Peru ranks as a major source of blast furnace ore, supplying 945,000 tons in 1953 and nearly 2.2-million last year. Chile ranked fourth with 1.8-million tons and Sweden dropped to fifth with 1.7-million.

Utah Power & Light Co. Plans Line to Moab

UTAH POWER & LIGHT CO. has asked the state's Public Service Commission for authority to build a $2-million transmission line to serve Monticello, San Juan County, via the Big Indian mining district.

Decision to build the line, on which ODM has granted an amortization cer-

tificate, was taken only after a lengthy survey by the utility, directed at probable mine life and in light of AEC's announced termination date of the purchase program.

Unofficially, the utility is said to have taken the position that some buying program of reasonable stature will undoubtedly be in effect after '62, and that mills now programmed will be in operation past that date.

Proposed project involves a 130,000v line from Helper to Moab, at a cost of approximately $1.5-million and a 69,000v line from Moab to Monticello, at about $400,000.

Inco Reveals Details Of Flash Smelting

OXYGEN FLASH SMELTING process for treating copper sulphide concentrates, developed by International Nickel Co. of Canada, was publicly outlined for the first time at the annual meeting of the Canadian Institute of Mining and Metallurgy in Toronto April 19. Under development since 1945, it replaces the normally used fuel with low-cost oxygen.

In the process, finely divided copper concentrates and a flux are dried and injected with oxygen into a preheated furnace. Oxygen combines with some of the sulphur and iron of the chalcopyrite to form SO_2 and iron oxide. Heat of the reaction is sufficient to melt the residual Cu-Fe sulphide to form a matte; iron oxide combines with the siliceous flux to form a slag; and SO_2 passes off as 75% of the furnace gas. Slag is showered with iron sulphide droplets at the skimming end of the furnace by flash smelting pyrrhotite. Droplets extract additional copper values from the slag as they settle through into the matte beneath.

AEC Bonuses Top $5-Million

AS OF APRIL 7, 1955, bonus payments to uranium miners for initial production of U_3O_8 from certified properties reached $5,001,019, according to Sheldon P. Wimpfen, manager of the Grand Junction operations office.

Figure represents 2,889 payments, made since the program was initiated March 1, 1955, to 538 properties. Ninety-one of the properties have received the full benefit amount.

Kitimat Expands

PRIMARY ALUMINUM production capacity of the Kitimat smelter, B. C., will be increased to 330,000 tons, according to an announcement by Nathanael V. Davis, president of Aluminium Ltd. Present capacity of the smelter is 91,500 tons; an additional 60,000 of capacity authorized last October is under construction. Newest authorization, to cost $190-million, will add 180,000 tons.

(*Mining news continued on p. 120*)

As we went to press....

AEC has signed a contract with Mines Development Inc. for construction of a mill at Edgemont, S.D. Agreement has also been reported between AEC and U.S. Vanadium Co. for a "large" expansion at Uravan. Construction is already under way.

Inspiration Consolidated Copper Co. hopes to add about 350-million lb to copper "recoverable from ore reserves" with new facilities and improved metallurgy at the Inspiration concentrator. Construction costs in connection with conversion to a dual process involving leaching followed by concentration is estimated at $3.6-million.

Sale of uranium interests for a reported $10-million is in the works in Salt Lake City. Syndicate headed by Maurice Yates, Salt Lake, and H. O. English, Casper, Wyo., which includes several movie stars and prominent Utahns and New Yorkers, will purchase Ruddock interests in the Big Indian District. Agreement mentions no sum, but figure in the $10-million bracket was reported quoted by Ruddocks to other parties. Involved in purchase are: Cal-Uranium mine, one of the oldest San Juan County producers; Almar Minerals Co., controller of the Daniel and Ruddock claims and 700 mining claims in the District.

Republic Steel Co. has announced plans for opening Genesee iron orebody, which lies adjacent to the Tobin mine, Crystal Falls, Mich. An estimated 1.5-million tons of ore is reported in the body, whose existence has been known for years.

Floyd B. Odlum, major figure in recent Plateau mergers, has agreed through Atlas Corp., which he heads, to purchase $1,265,625 worth of treasury stock of Northern Australia Uranium Co., subject to examination by Atlas. Northern Australia holds rights to a 700-sq mile property in the Alligator River district, near Darwin. Odlum also was reported interested in construction of two uranium mills in Utah; one to handle Hidden Splendor ore and another to handle Federal Uranium (Big Indian) ores.

Columbia-Southern Chemical Corp. announced plans to construct a multi-million dollar titanium tetrachloride plant at Natrium, W. Va.

Texas City tin smelter operation will be continued to June 30, 1956 when Resolution 26, already unanimously passed by the Senate, sails through the House, as it is expected to do.

Wenden, Ariz. manganese ore-buying depot's doors were to close April 30. (See Arizona news, this issue) Assistant Secretary of Interior Felix A. Wormser, testifying before House Interior and Insular Affairs Subcommittee on Mines and Mining, recommended that bills to extend Government manganese purchase program be "not enacted" because the bills would make only "a minor contribution" to the supply of manganese at disproportionate cost to the Government.

Behind the By-Lines . . .

G. P. Lutjen

There are certain professions, we understand, where 8 is easier to make than 4. This is not true of publishing, nevertheless we have contrived to make this off-buff (or is it dirty ivory?) insert, 8 pages instead of 4. One advantage is that it permits us to keep the three *Markets* pages together instead of leaving one stranded back around page 105. It seems that people who like to read *Markets* pages like to read *Markets* pages together and have said so. Another advantage in *Markets* is that we can now furnish the daily averages of the London Metal Exchange. These statistics come in after the first of the month when it would be too late to put them anywhere else in the issue without dire consequences.

This expansion also provides a way to bring you any news stories that break as we are about to go to press. This not only improves service to the reader, but considerably reduces the Frustration Quotient of our News Editor. We are pleased to announce that *This Month In Mining* on page 72 is now the communication of a contented commentator.

As a rule we don't impress too easily but back in March we spent the better part of an afternoon being impressed by Carroll Wilson. As ex-AEC general manager and ex-uranium company president, now vice president and gen. manager of Metals and Controls Corp., Mr. Wilson was being interviewed by *E&MJ* on the question of the "uranium milling bottleneck," as sensitive a controversy as ever hit these hallowed pages—and there he was answering any and all questions fully, frankly and fluently. Not one did he try to dodge despite the fact that it meant stepping out on a whole treeful of limbs. Wait till you see those limbs on pages 90 through 95!

With nothing personal to gain, Mr. Wilson is laying himself open to possible criticism because he feels that in uranium procurement, a matter of national importance, a mistake is being made which can be rectified. We concur with Mr. Wilson, that if a "serious bottleneck in milling" exists, the first step toward solution is an open, unmalicious, constructive discussion of the problem by all who can contribute. Such a discussion has to start somewhere and so Carroll Wilson and *E&MJ* are taking the plunge together.

Next month we will follow up with a discussion of Mr. Wilson's analysis of, and proposed solution for, the situation by AEC officials and by prominent men in the uranium industry. This is an open invitation to *E&MJ* readers to contribute to this discussion. Any course of action should be charted by the best (and calmest) thinking of all of us.

"Do-it-yourself and land in the hospital" is about the way this whole do-it-yourself trend adds up. According to Arthur A. Burroughs who counts accidents for an insurance company, people who insist on doing-it-themselves can be electrocuted on aluminum ladders, set afire by spray paints, blown up by wood or varnish dust, burned to death in beds with fancy plastic trim, maimed by power tools and poisoned by insecticides. The luckier ones will escape merely with fingers hammered to pulp.

If your wife can look over the following list of 600,000 do-it-yourself injuries Mr. Burroughs has tallied, and then request any household activity on your part more strenuous than turning the light switch on and off, you've got grounds for divorce. There were 115,000 people hurt doing carpentry, 98,729 making their own furniture, 95,000 replacing broken window panes, 76,000 painting outside, 31,000 painting inside, 57,000 fixing gutters on roofs, 33,000 pruning trees, 16,400 erecting TV antennae, 11,000 repairing chimneys, and 47,000 moving storm windows. When you compare these appalling figures with the number of injuries sustained opening beer cans (23 no-lost-time accidents*), you can judge for yourself how you should spend your leisure time in the future.

With do-it-yourself advocates being hoist right and left on their own petards, we have a timely article on what might be considered a Home Petard Kit. The only thing is that the make-it-yourself explosive, Akremite, described on pages 96 through 99, is so safe to handle that it's extremely unlikely that anyone could indulge in self-hoisting if he wanted to. All you have to do is buy some commercial grade ammonium nitrate and carbon black and mix it at your mine. Four case histories in the article, "Make-It-Yourself Explosive Shatters Blasting Costs" will show you how this inexpensive material cut costs and raised efficiency.

When company officials report to the stockholders they pretty much have to lay things on the line or the next thing they hear fellows named Young or Wolfson are offering to cross proxies with them. This is what makes the annual reports such fruitful reading. Not only can you see how a company has been doing, but frequently you find the first utterance of future plans. That's why our report on annual reports is up ahead on page 72. More will follow next month. To save you time thumbing through auditors' statements and such, we've produced a concentrate of what these companies have up their sleeves in the way of new projects and expansion plans for the coming year.

One report you won't find is that of Patiño Mines, a rather wistful indictment of Bolivia's expropriation of the company's properties. Despite the fact that mines and machinery were "in perfect order" at the time of nationalization, production has dropped from 877 long tons of fine tin to 700 tons. During 1953 the nationalized mines reported a loss of $4¼-million: Even at lower tin prices Patiño was usually able to show a profit even after paying heavy taxes. What's more, the Bolivian Workers Union admits that mine workers are now working more and receiving lower pay.

Comment, anyone?

* Horseback estimate.

Free World Uranium Reserves—Where Do We Stand?

JESSE C. JOHNSON

URANIUM RESOURCES for future power requirements of the Free World range from 1- to 2-million tons to "many millions of tons" according to Jesse C. Johnson, director of the division of raw materials, AEC, who addressed the joint meeting of the Atomic Industrial Forum and Stanford Research Institute at San Francisco last month.

Variance in amount of reserves was based on what Johnson classed as the various arbitrary costs of high-grade concentrate. "Moderate" cost was defined as less than $12 per lb, and under that category, he estimated a reserve of 1- to 2-million tons from areas now under production or under development.

"Intermediate" cost ($12 to $30 per lb) uranium concentrate would greatly increase reserves, Johnson said, and "high" cost (up to $50) would bring in vast, low-grade deposits, such as shale and phosphate sources, and push reserves up into "many millions of tons."

The raw materials division director also noted that whole geographic areas like South America, potentially hold great amounts of uranium, and "on the basis of geological probability, hundreds of thousands of tons of uranium in millions of tons of ore remain to be discovered in the sedimentary deposits of our western states.

"Ore processing technology also has developed rapidly," Johnson said, "and methods are now available for extracting uranium from very low-grade sources at costs which may not be prohibitive for the nuclear power industry of the future."

The Uses of "High"

"In a competitive market," he said, "much of the uranium in the 'moderate' cost category might be sold profitably at less than $10 per lb. With advancing technology there should be more efficient utilization of uranium and a higher recovery of potential energy. This may increase the fuel value and permit the use of 'high' cost uranium without adding to the cost of power."

Today, Johnson said, private uranium activities in the U. S. have a value of about $100-million per year. In Canada, he noted, private financing totaling $70-million has been arranged in the past two years for three uranium projects alone. "Probably more private capital is going into uranium production than into all other activities in the atomic energy field . . . for projects with a productive life which will extend well into the atomic power era."

Investment in South African mills is now approaching $150-million, Johnson said, and upon completion of the present program will be about $180-million.

80% From Large Finds

In the U. S., larger orebodies are becoming the major source of uranium reserves, he said. In contrast to the small deposits which provided material in the early stages of the program, now "probably 80% of our present known ore reserves are in deposits larger than 50,000 tons . . . deposits that can supply uranium at 'moderate' cost." But, said Johnson, most of the deposits now developed may be mined out in less than ten years.

He pointed out that new production being developed in Wyoming, North and South Dakota and other western states has a uranium content which generally ranges from 0.1% to 0.5% U_3O_8, and many of the deposits are small.

In his talk, Johnson answered the question:

"How long will the Government market continue; when will there be a commercial market; and what will be the size of that market?"

He said, "The Government market is guaranteed through March 31, 1962, and beyond that it still could be a factor until the commercial market can sustain a production rate of some importance.

"In addition to deposits now being mined, our domestic phosphate and shale deposits constitute a large low-grade uranium reserve. Reserves of commercial phosphate rock in Florida and our western states are placed at 5-billion tons. The uranium content is estimated at 600,000 tons, an average of about one-quarter of a pound per ton. The reserves would be greatly increased by including low-grade phosphatic material not presently considered commercial. Tennessee and adjoining states have about 85-billion tons of shale averaging slightly more than one-tenth of a pound uranium per ton. This represents a reserve of 5- to 6-million tons of uranium. . . .

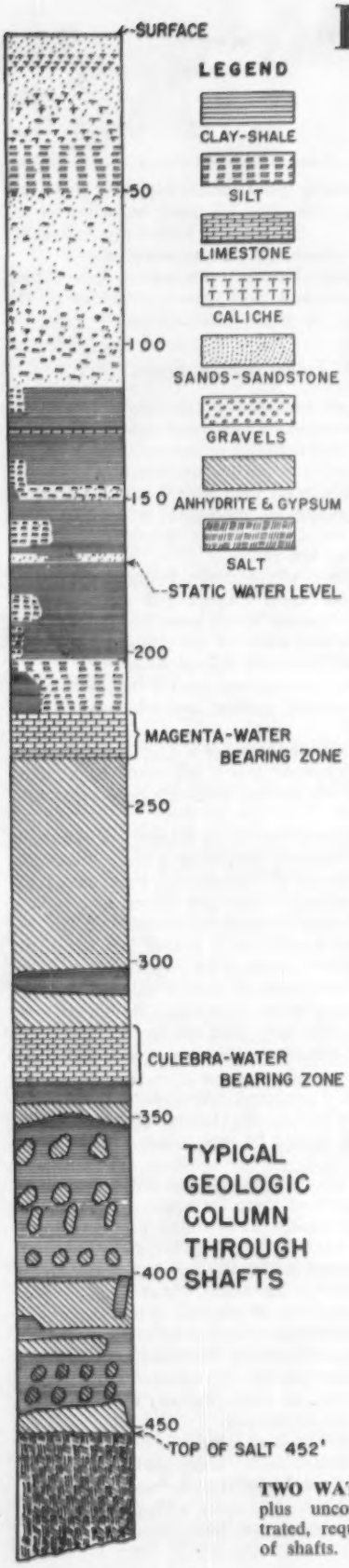
". . . Until recently, it appeared that uranium from shale would cost in excess of $50 per lb. However, our work now indicates that the cost should be well below $50, possibly nearer $30 per lb."

Speaking of Canada's potential, Johnson noted that while uranium has been produced there for about 20 years, the major deposits from a standpoint of future production are the deposits around Lake Athabaska, Saskatchewan and Blind River, all developed during the last few years. "It is a reasonable assumption," he noted, "that Canada has several hundred thousand tons of uranium in the 'moderate' cost class." If the "intermediate" cost were made effective, the quantity would be substantially increased.

Annual uranium requirements, the speaker said, would probably be 30,000 tons, or more, before "intermediate" cost resources would be considered.

Touching on a much-discussed subject in his talk before the energy group, Johnson said, "Uranium is, and may continue to be, the principal source material for the production of nuclear energy—whether for weapons or power. Thorium, which can be converted into fissionable U-233, may become a competitor."

How Southwest Potash Corp.



TYPICAL GEOLOGIC COLUMN THROUGH SHAFTS

TWO WATER BEARING HORIZONS plus unconsolidated formations penetrated, required concreting and grouting of shafts.

IRA A. HERBERT
Mine Engineer,
Southwest Potash Corp.,
Carlsbad, N. M.

IN 1950 SOUTHWEST POTASH CORP., subsidiary of American Metal Co., Ltd., selected two shaft sites in the Carlsbad, N. M., area after several pilot holes had been drilled to test ground conditions. Existence of unconsolidated formations above the salt plus the necessity of sealing off water flows required grouting and concreting procedures described in this article.

Because of the solubility of potash salts in water, the sealing off of overlying water-bearing horizons is an exceedingly important step in the Carlsbad potash district. This accounts for the thorough methods used to grout water zones penetrated by the two shafts sunk by Southwest Potash Corp. See adjacent column showing position of water zones.

Winston Bros. Co., Minneapolis, Minn., contracted to sink the two shafts under direction of Frank Manning (later replaced by Charles Gail) and James Tripp Jr., project engineer.

Shaft No. 1, ore hoisting, see illustration, is a 15-ft diameter circular concrete-lined shaft enclosing two hoisting compartments, and manway and utilities compartment. The shaft is lined with reinforced concrete (16 to 24 in. thick) to a depth of 474 ft, or about 20 ft below the top of the salt. From this point to the main level, 898 ft below the collar, the shaft is unlined, since the salt formation is stable.

Below the main level for an additional 186 ft, the shaft is rectangular, including the additional compartment for the Nock and Garside passenger elevator for servicing crusher, pockets, skip loading, and spill pocket levels. Total depth of shaft is 1,086 ft.

No. 2 Is Utility Shaft

Shaft No. 2, 400 ft south of Shaft No. 1, for men, materials and ventilation, is circular, 20 ft in diameter. It is divided in the center by a 9-in. curtain wall, one-half of the shaft being used as an exhaust airway for ventilation, the remainder having two cage compartments, manway, and utilities compartment. The shaft is lined with reinforced concrete to 474 ft and unlined for remaining 455 ft.

The first 120 ft of each shaft was sunk with a 1½-yd Lima crane, which handled steel forms, muck, men, concrete, etc., while the 135-ft steel headframe for No. 1 Shaft and the 90-ft steel headframe for No. 2 Shaft were being erected, hoists installed, batching plant, machine shop, cement warehouse, etc., erected and concrete shaft collars and duct for fan installation poured.

Sinking No. 1 Shaft

Sinking equipment in the No. 1 Shaft included a Vulcan single-drum, 450-hp hoist, 1⅜-in. non-rotating cable, safety crosshead, sectionalized steel forms for concrete lining, jackhammers, Riddell mucking machines, 54-cu ft buckets. Concrete lining was poured in 6-, 12-, 18-, 24-, or 30-ft sections depending on ground conditions.

The first water-bearing strata, the Magenta formation, about 12 ft thick, was encountered at 221 ft, where a 5-ft concrete pad was poured in shaft bottom. Twenty diamond drill holes were drilled into the Magenta formation and grouted under low pressure, reaching under the pad, into the upper Magenta and behind shaft lining. After allowing grout to set, holes were bottomed in the anhydrite below the Magenta and further grouting was done.

Shaft sinking and blasting through this section and the anhydrite member, evidently disturbed the contact between the anhydrite and Magenta formations and allowed about 35 gpm of water to flow into the shaft. Further grouting reduced this flow to less than 1 gpm.

A second water-bearing strata, the Culebra, was encountered at 320 ft and penetrated with grouting methods described later.

Below the Culebra formation and to the salt, clay, sandstone and anhydrite boulders caused difficulty in drilling, blasting and mucking.

At 493 ft a pump level station was cut and a sump excavated and concreted. Two water rings, see illustration, were installed in concrete lining above the sump level. Seepage water was piped from the rings to the sump and then pumped to the surface.

Sinking through the salt was relatively easy, with exception of thin clay seams occurring in the otherwise solid salt formation which tended to

Sank and Sealed Two Concrete Shafts

The Cover Design

The symmetrical pattern on the cover of E&MJ is the plan view of drills holes used to grout the water-bearing formations penetrated by the two shafts described here. See p 80 for description of the grouting technique.

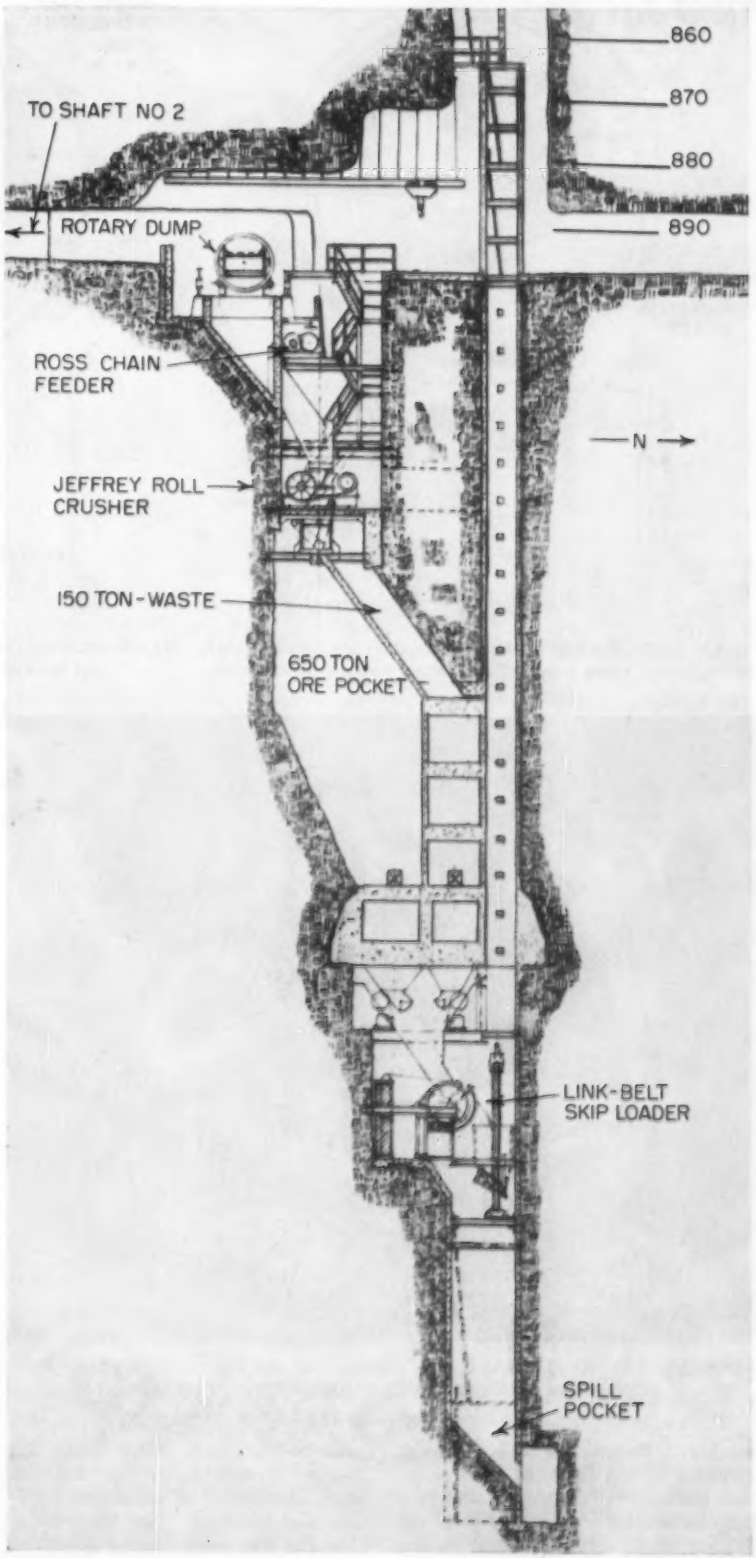
propagate the whole round as one shot, resulting in blasting of shaft facilities, including mucker rails for the Riddell mucker. A number of occluded high pressure gas pockets were struck, blowing drills and steel out of holes, injuring the driller.

As the shaft approached the main level, excavation for the shaft station was started and carried along with the shaft sinking. A small crosscut was connected to Shaft No. 2 for ventilation and service. The shaft was then sunk 90 ft below the main level and a pilot raise driven through the future ore pocket and crusher area, connecting to the main level. Blasted material from the main level was slushed to the raise and then mucked out by the Riddell mucker located in the shaft. As the excavation for crusher, ore pockets, etc., was done, hitches for structural steel and concrete pillars were cut out. The muck pile was used for staging.

A bulkhead at the crusher level enabled men to prepare concrete for machinery installations, while the shaft was being completed to a depth of 186 ft below the main level. Concrete work was then started from the bottom of shaft for spill pockets, guides and shaft steel. When the main level was reached, a heavy bulkhead was placed above the level, then cutting of hitches, installation of shaft steel, guides and manway proceeded to the surface. Meanwhile, the Nock and Garside elevator, rotary dump, chain feeder, crusher, and skip loading equipment were being installed by Stearns-Roger Manufacturing Co.

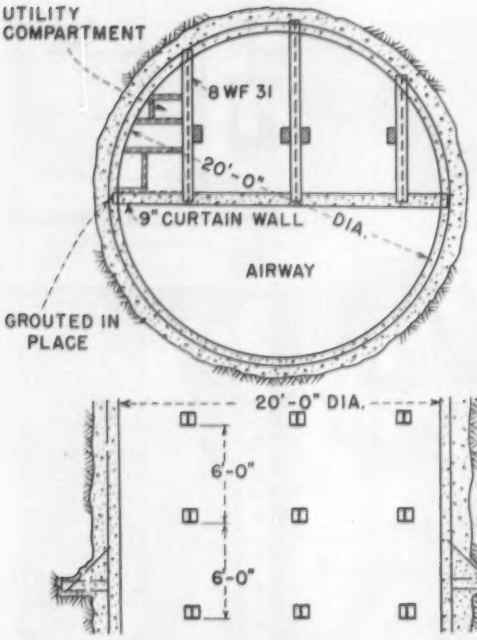
Sinking No. 2 Shaft

Sinking operations were similar to Shaft No. 1, with the following exceptions: (a) the permanent Stearns-Roger man hoist was used for sinking and (b) operation of the Riddell

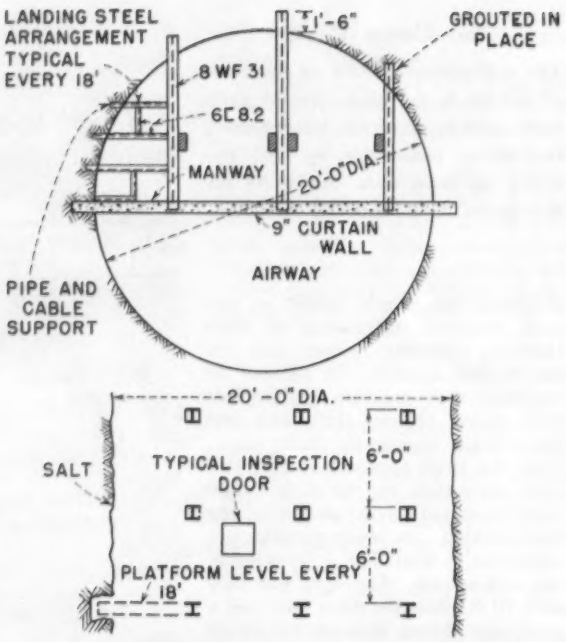


THE NO. 1 SHAFT BOTTOM is equipped with modern dumping, crushing, feeding, and loading equipment.

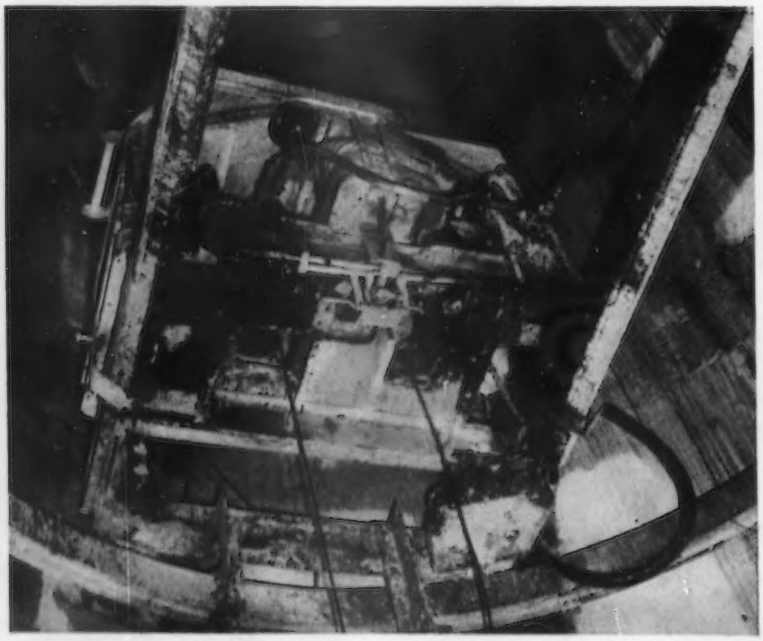
Design Details of Southwest No. 1 Shaft



PLAN AND SECTION of 20-ft circular ore hoisting shaft through rock strata requiring reinforced concrete construction.



PLAN AND SECTION of the same ore-hoisting shaft through salt formation where concrete was not required.



LOOKING UP NO. 2 SHAFT. Riddell mucking machine is mounted on both circular and rectangular tracks for complete maneuverability.

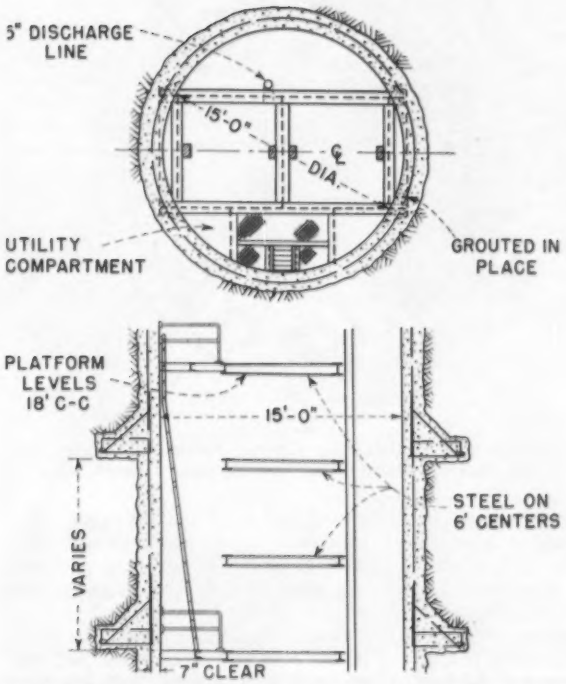
mucker. Because of the increased diameter of this shaft, an 18-ft diameter circular rail supported the rectangular mucker rails and allowed the mucker to be rotated to any desired point in the shaft. This aided the placing of steel forms for concrete pours, installation of temporary facilities, and mucking. See illustration.

As the first water bearing zone, the Magenta, was approached, pilot holes carried ahead of sinking indicated only a small flow of water from this zone. With the experience gained in passing through the Magenta formation in Shaft No. 1, sinking was continued without grouting. Sinking and pouring of lining in 6-ft sections was successful through the entire Magenta formation and 5 ft into the underlying anhydrite.

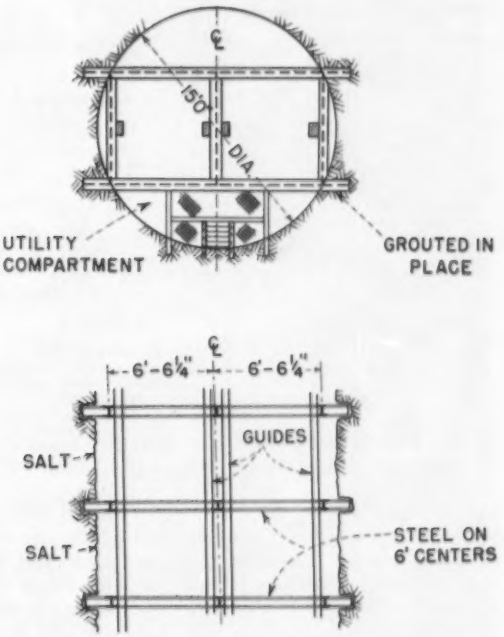
Flow Rises to 200 gpm

The contact between the base of the Magenta and anhydrite contained a ½-in. seam of clay and when intersected by the shaft was making about 30 gpm of water. This flow gradually increased to about 200 gpm, imposing a problem. The flow was sealed by drilling holes into the contact between the Magenta and anhydrite, inserting 2-in. pipes and caulking around the pipes with steel wool and oakum. See illustration. About 90% of the water came through these pipes. Forms were then set and a conventional pour made with a richer mixture to offset loss of cement by washing. The pour was successful. After the pour settled, grout was injected behind the liner and into the contact through the bleeder pipes and other pipes left in the forms. The flow of water was re-

Design Details of Southwest No. 2 Shaft



PLAN AND SECTION of 15-ft diameter utility shaft through water-bearing or unstable ground requiring concrete.



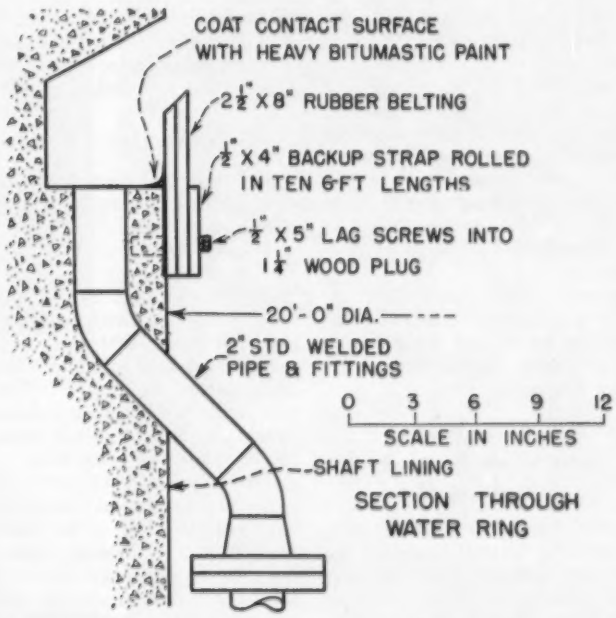
PLAN AND SECTION OF SAME SHAFT through salt formation to main level. No concrete was required.

duced to about 20 gpm, coming mainly from joints between pours. After forms were removed, more grout was injected behind the lining and water flow was reduced to about ½ gpm.

As shaft sinking proceeded, the Culebra water bearing formation was reached and grouted. The formation below the Culebra was the same formation as found in Shaft No. 1, namely, clay, sandstone and anhydrite boulders. As a further complication, the shaft site churn-drill hole had allowed water from the Culebra formation to come in contact with the clay making it difficult to drill, blast and muck.

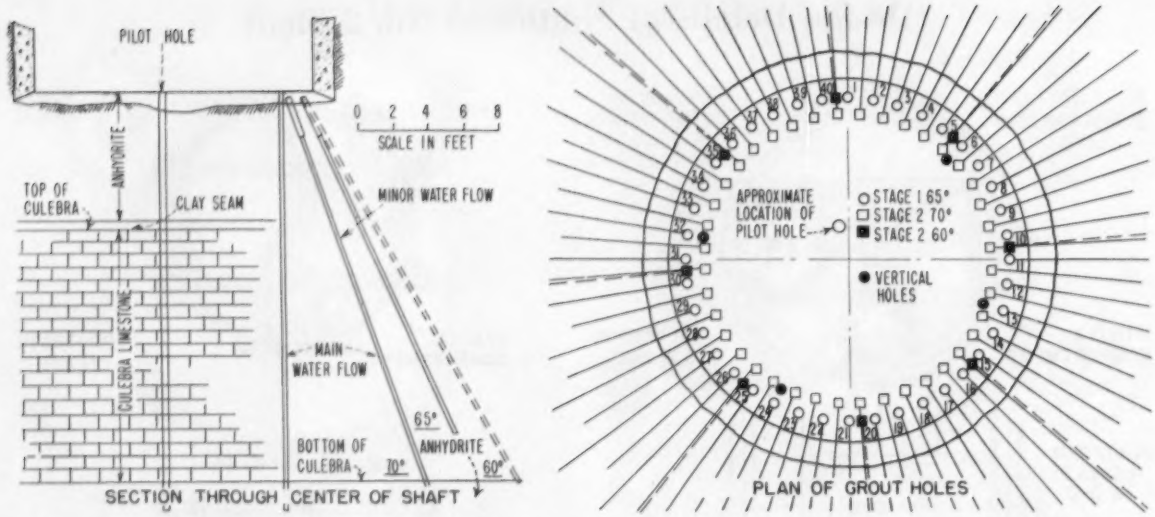
Sump is Provided

At 493 ft, a small crosscut was driven for connection to Shaft No. 1, excavation was made and concrete poured for a 5,000-gal sump. Sinking through the salt section proceeded rapidly to the main level at 887 ft. At this point, the shaft station was excavated, an 18x6½-ft crosscut connected to Shaft No. 1 station and 225 ft of drifts, 24x6½ ft, were driven. This excavation was done in three stages: first, ore was removed and stockpiled on the surface; second, backs were slabbed for proper clearance; and third, bottoms were excavated for correct grade. The shaft was then sunk to the final depth of 929 ft.


COAT CONTACT SURFACE WITH HEAVY BITUMASTIC PAINT
2½" X 8" RUBBER BELTING
½" X 4" BACKUP STRAP ROLLED IN TEN 6FT LENGTHS
½" X 5" LAG SCREWS INTO 1¼" WOOD PLUG
20'-0" DIA.
2" STD WELDED PIPE & FITTINGS
0 3 6 9 12
SCALE IN INCHES
SHAFT LINING
SECTION THROUGH WATER RING

WATER RINGS were installed at two points in the shafts to collect seepage flowing down the shaft walls. The 2-in. pipe removes the collected water.

A 9-in. reinforced concrete curtain wall dividing the shaft in half was poured during the finishing stage. The first 38 ft from the bottom was made with a conventional pour, and the slip form dropped into place. Concrete was mixed at the shaft collar



DRILL PATTERN SHOWN ON COVER is explained in the above plan and section of diamond drill holes put down through the water-bearing Culebra formation. Water flow to the shaft was sealed off by pumping grout through holes.

and dumped directly into a cement bucket which was lowered to the slip form as needed. Average pouring speed with slip forms was 1.4 fph. A maximum of 46.1 ft was poured in a 24-hr period.

Pouring of walls was halted at intervals to clean out chase at end of wall, remove temporary sinking guides and cut hitches for shaft steel in the salt section. As the curtain wall was raised, shaft steel was dropped into hitches but not cemented in place at this time.

The last 200 ft of the curtain wall was poured with a crane. During this time, the 90-ft headframe was moved back from the center line of the shaft to its permanent location.

Total time for pouring 850 ft of wall, cutting hitches, etc., was 38 days. A total of 533 cu yd of concrete was poured.

Permanent guides were then installed and structural steel was cemented into place and the manway installed. Both shafts were completed in September 1952.

Steel Forms Were Provided for 6-ft. Lifts

Concrete Forms Corp., Irvington, N. Y., supplied the steel forms for the shaft lining. Sufficient forms were on hand for making a 6-, 12-, 18-, 24- or 30-ft pour. Each 6-ft section was divided into six panels for the 15-ft diameter shaft and eight panels for the 20-ft diameter shaft.

Panels were handled below the safety crosshead, and the Riddell mucker aided in swinging them into place. Installation of reinforcing steel and forms usually required about 8 hours for a 12-ft pour of concrete.

Concrete was mixed at a batching plant equipped with a 16 S Worthington mixer installed about equidistant from the two shafts. A cubic yard of concrete was transported to the shaft in a dump truck, transferred to a concrete bucket and lowered to the forms. An "elephant trunk" discharge on the concrete bucket facilitated pouring. Pouring rate varied from 6 to 14 cu yd per hour, depending on shaft depth. The concrete was allowed to set about 8 hours before stripping of forms and sinking was resumed.

Grouting Under Contract

Grouting of both shafts was under contract to Intrusion-Prepakt, Inc., of Cleveland, Ohio.

Mixing tanks and two air driven 6 x 3 x 6 pumps at the shaft collar discharged through a 2-in. pipe line leading down the shaft to the grouting station. Two 200-gpm centrifugal pumps were used to pump water from shaft bottom to surface. Telephone communications were maintained between grouting point and surface for proper control of grout flow.

The standard procedure was to place 2-in. nipples on a predetermined pattern in the floor of the shaft. See illustration. Diamond drill holes through the Culebra were started on the outer ring and on opposite sides of shaft. When water inflow reached the capacity of the pumps, drilling was stopped and holes were cleaned with jet by alternating with air and water until holes and openings were cleared of limestone, clay or other material. Grout was then pumped into each hole at a maximum pressure of 500 psi until refusal, the valve closed, and grout allowed to set. This procedure continued until all holes were grouted. At one stage of grouting, the floor developed leaks through cracks or mud seams and it was necessary to place extension nipples on holes, pour a 1-ft concrete pad and proceed with drilling and grouting. If holes developed leaks, they were redrilled and grouted until a good seal was obtained.

When grouting was completed test holes were core drilled. These indicated only a small possible flow of water. Test holes were regrouted, and sinking proceeded. The maximum flow of water from the Culebra during sinking was about 20 gpm. This was sealed off by grouting behind the concrete lining. Inflow of water was thereby reduced to about 1½ gpm. Grouting in both shafts consumed a total of 3,160 sacks of cement.

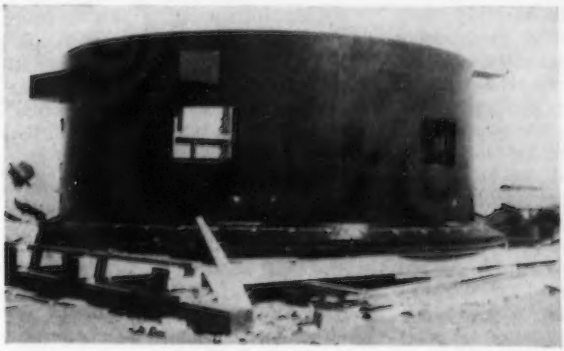
The method of cleaning the holes and opening the water channels with high pressure air and water appeared to be a distinct aid in allowing the grout to fill these openings. It is also believed the relatively low pressure of 400 to 500 psi used in pumping grout into the formation, forced the grout into the opening but did not fracture surrounding formations to create other water channels which would have made grouting considerably more difficult.

Acknowledgments

The writer wishes to thank F. H. Stewart, general manager, Southwest Potash Corp., and James Tripp Jr., project engineer for Winston Bros. Construction Co., who supplied information and data presented in this article.

SURFACE PLANT OF SOUTHWEST POTASH CORP.'S new property in the Carlsbad, N. M., area. The two shafts that were sunk by methods described in this article are shown in the foreground. The No. 1 shaft feeds the conveyor.

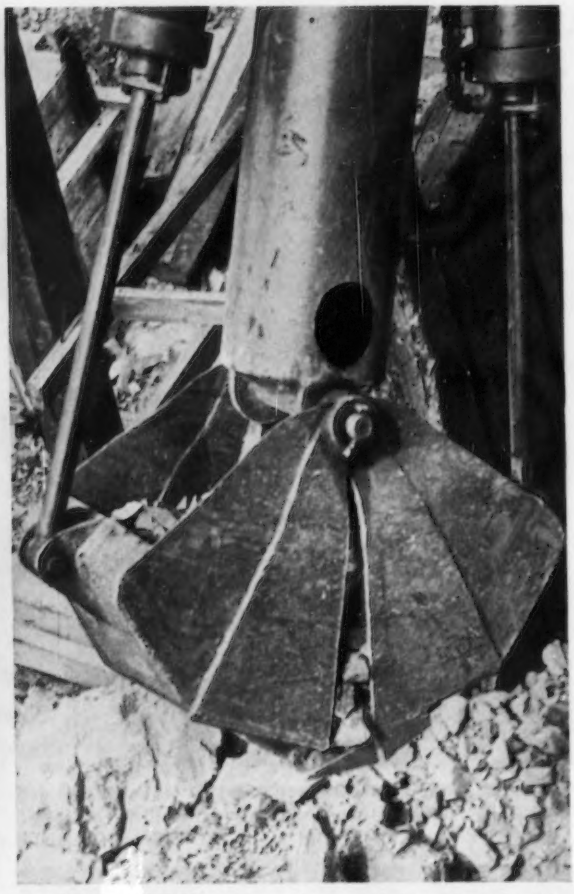
F. H. STEWART, general manager, right and C. P. Gail, project manager for Winston Bros. Construction Co. inspect shaft.



ASSEMBLED STEEL SHAFT FORM for No. 1 shaft showing bulkhead or ring at base, pouring doors and blockouts.

PAUL O'NEAL, shaft superintendent for Winston Bros. inspects concrete after completion of a pour in the Magenta.

POSITIVE CONTROL of clamshell positioning and operation is obtained with two levers in the operator's cage.



POSITIVE ACTION produced by powerful air pistons enables clamshell to pick up a healthy bite of broken rock in shaft.

New Positive-Action Mucking Machine

ROGER V. PIERCE
Consulting Engineer
Salt Lake City, Utah

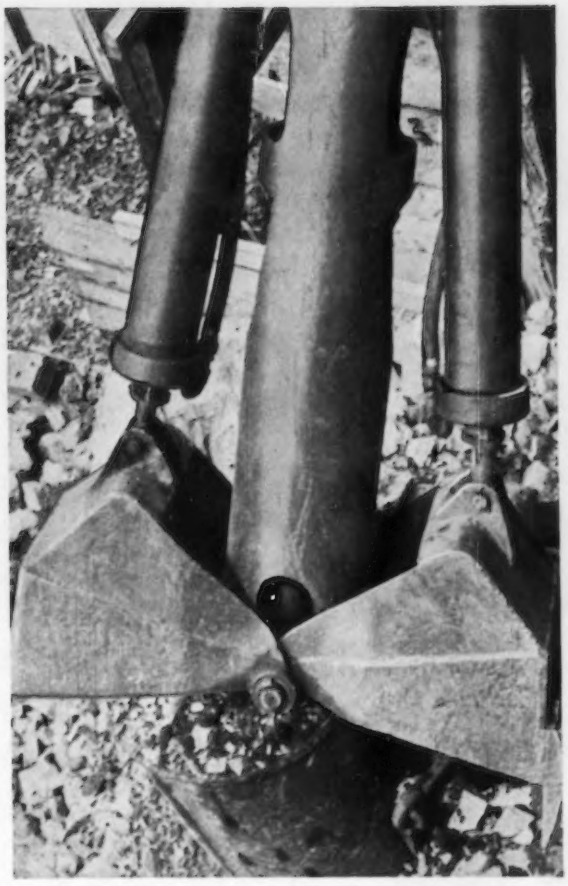
FROM CANADA'S MINING PROVINCE of Ontario, where currently many vertical shafts are being sunk, comes a new development in shaft mucking machines that may change the concept of shaft sinking methods, not only for vertical shafts, but *incline shafts* as well.

This unique, relatively simple-to-operate machine utilizes seven air cylinders centrally controlled by two operating levers. These "joy-stick" levers actuate multiple directional air valves that control the positive opening and closing clamshell bucket with ease and move the clamshell bucket back and forth rapidly to any point on the shaft bottom.

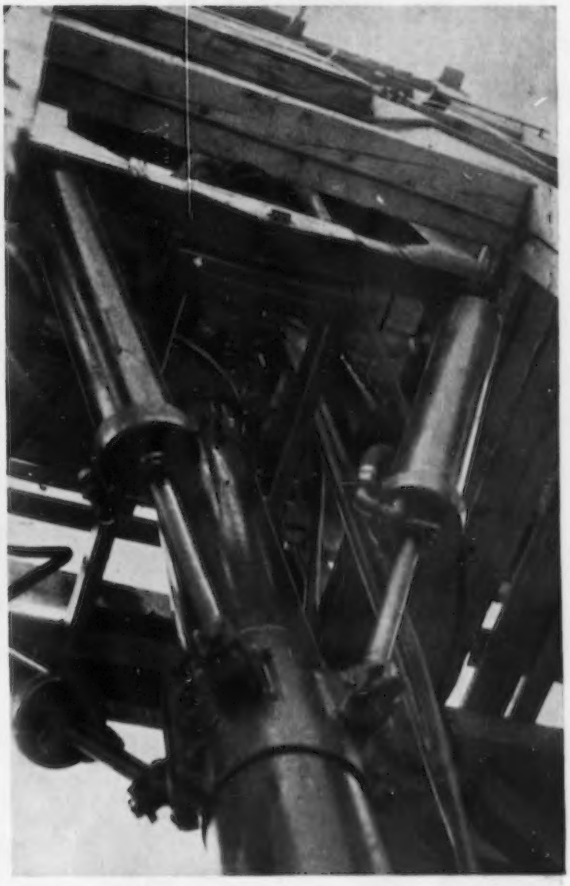
Warner Cryderman (whose family has long been associated with Canadian mining), possessing a background of considerable practical experience in operating mining machinery and in supervisory work as a master mechanic, recognized the challenge that shaft mucking problems offered. After observing, studying, and considering other shaft mucking machines being used, Mr. Cryderman built a model of a new type shaft mechanical mucker that incorporates several new basic ideas. This machine, now patented, carries his name. In working out the design of the machine, his studies and experiments centered on building a rigid, precision telescoping boom that delivered a positive, pressure-controlled crowding action to the air cylinder-actuated clamshell bucket. He desired to develop positive loading and positioning of the bucket with positive pressure at all times to the actual point of digging.

After the initial models were built and patents applied for, Mr. Cryderman presented his model and operating ideas to a group in Toronto and a company, "Shaft Machines, Ltd.," was formed. This company, with R. Mac Alpine as president, started pushing development of the machine. Shortly after the company was formed, a machine incorporating the ideas demonstrated by the model was constructed. Operating design bugs and mistakes had to be worked out, and in due time the first workable machine was completed. Operators and the company group decided that the machine was too heavy after a trial. Another model followed, and this was simplified and built considerably lighter.

The shaft contracting firm of Pogue and Vendetti realized that the invention had possibilities and became interested. They offered to try the machine in one of their actual sinking operations.



CLAMSHELL drops load in bucket. Here again positive positioning and operation of clamshell jaws is assured.



STOUT AIR PISTONS installed below the operator's platform regulate all positioning of the telescopic boom.

Works in Incline and Vertical Shafts

G. A. McKay, general manager of Leitch Gold Mines at Beardmore, Ont., became the first mining operator to try out the machine. McKay, along with Messrs. Cryderman, Pogue and Vendetti, helped solve design problems during initial experimental development stages of the machine.

Unit Is Air-Powered

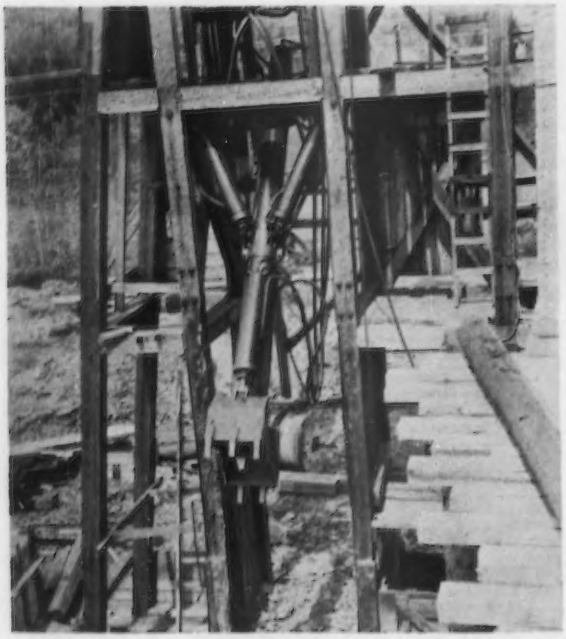
This air-operated machine is powered by air cylinders. It is mounted beneath the deck of a standard mine cage suspended through a gimbal-type support. The air-actuated clam is attached to the end of an air-operated telescoping boom. This telescoping boom will reach in and out in any direction from the central pivot point, with direction controlled by the swing cylinders. It is possible to make any and all of these moves either separately or together through a two-lever positive control.

Installation Is Fast

In this operation, the mucking machine was lowered in the end compartment of a three-compartment shaft. It was lowered as simply as any other type cage in a vertical shaft, traveling regular shaft guides to a point within reach of the muck pile. The complete outfit—cage, platform, mucker, etc.—was quickly spotted, and two chains, one on each of the two uprights on the cage, were tied around the two nearest shaft posts to steady the operating platform. These ties were quickly completed. A quick connection was made to an air hose, and from the time the machine reached the level where it was to be operated, all connections made, and the actual mucking operation commenced, less than four minutes had elapsed.

Very little vibration on the operator's platform and very little, if any, pull against mine shaft timber could be noticed during observation of the machine in action. Floodlighting gave the operator adequate visibility over the entire shaft bottom.

In this operation, a two-drum 75 hp hoist with 900 fpm rope speed was used to handle 22 cu ft sinking buckets, each with a capacity of about 1¼ tons of muck. The rough cross section of the shaft measured 16 ft 2 in. x 6 ft 4 in. with 8 x 8-in. timbers and 6 x 8-in. dividers. In this three-compartment shaft, the end compartment serviced the lowering and raising of the machine, the center compartment serviced the two muck buckets, and the third compartment was blocked off for manway, pipes, electrical cable, etc. In the actual mucking operation, two buckets were in use. A fast switch-over change was used to unhook the empty bucket on delivery to the shaft bottom and to engage the loaded bucket for hoisting. On the mucking operation, two men are required on the bot-



EXTENSIBLE MAIN BOOM is swung out of the shaft demonstrating possibilities of mucking out shaft stations.

SIDE VIEW showing how far the telescopic boom can be extended to reach muck in the far corners of a shaft.

DEVELOPERS OF THE MUCKER include G. A. McKay, general manager, Leitch Gold Mines; Warner Cryderman, designer; and Clair Pogue, shaft contractor.

tom to set the buckets and to switch the hoisting cable from the empty to the full bucket. One man operates the shaft mucker. A three-man crew handles all details of the mucking cycle. Four men are in the bottom during the timbering or drilling operations.

In actual timing, the buckets were loaded in 63 to 67 sec. By increasing the size of the machine, this performance could be speeded up. The big delay was not due to actual mucking time, but to hoisting service. This was not changed because the job was virtually completed.

After the mucking cycle was completed, the cables released, and the hose disconnected, the entire unit was raised high enough to avoid damage from blasting. Here it was anchored until needed again. Move required less than four minutes.

Two of these machines are now performing successfuly—the one observed in Ontario, and one that is being used to sink a five-compartment shaft in the Yellowknife area.

Apparently simplicity of the design of this machine will go far to eliminate maintenance work. There are no sheaves, hoists, or cables to be replaced.

For safety, the operator stays in the compartment when work is not being done directly above him. He need not move into or across the hoisting area. This machine could be located in the manway compartment if a three-compartment shaft were being sunk, and two compartments were desired for muck hoisting.

The Cryderman machine appears to be definitely competitive with other machines now being built. Main advantages of the unit are:

1. It is not necessary to suspend the machine on timber.
2. It will reach out and load the muck from a station cutting operation. This unit will extend as much as eight feet beyond the line of the shaft.
3. It will have applications in incline shafts as well as vertical shafts.
4. It is easy to move to surface or to an intermediate level for repairs.
5. There are no cables, sheaves or hoists used. Only air cylinders and valves will be needed for its manufacture.
6. It is planned that this patented machine will be offered as a complete production-manufactured machine available for outright purchase with a use-royalty provision.
7. The positive powered loading bucket is connected directly to the source of power. It does not depend on gravity for its digging action, and it is under positive control at all times.
8. Clam bucket revolves to open crossways or longways of the shaft.
9. It can be used where it is necessary to keep the timber close to the bottom.

Plans now call for the machine to be on a demonstration job in western Montana by the time this article appears in print.

HOLING THROUGH ON THE 600 LEVEL—A big event in any raiseman's life; and if the raise holes through "on the button," it's an equally big event in the mining engineer's life. See p 89 showing how close the engineers actually came.

Why Anaconda "Raised" the Kelley Supply Shaft

1. It was more economical than sinking

2. It was more practical than sinking

A. D. ROOD
Mining Engineer
Anaconda Copper Mining Co.
Butte, Montana

WHEN THE KELLEY NO. 1 SHAFT of Anaconda's Greater Butte Project was designed, provisions were made to convert the cage compartment into two additional skip hoisting compartments to speed up ore hoisting at depth. After this conversion takes place, men and materials will be handled in the new Kelley Auxiliary shaft some 142 ft south of the Kelley No. 1.

Raising Wins Out

Experience gained in raising and sinking the Kelley No. 1 shaft in fairly hard, coarse-breaking granite indicated that raising the new Kelley Auxiliary shaft full size from the different access levels provided by the Kelley shaft would prove most practical and economical. Raising was started from the 600 level in September 1952, from the 1300 level in December, and from the 2000 level in February 1953. In August 1953 a fourth heading was started from the 800 level, and all lifts had holed together and to the surface by December 1953, for a total distance of 2162 ft.

Raise Timber Used as Concrete Forms

Overall outside dimensions of the raise sets are 7 ft by 17 ft 8 in., identical to those inside of the concrete lining. This plan requires excavation behind the timber all around equal to the desired 16-in. thickness of concrete, making a minimum excavation dimension of 9 ft 8 in. by 20 ft 4 in. The 17 ft 8 in. dimension was broken up into three compartments for raising so as to meet the following conditions:

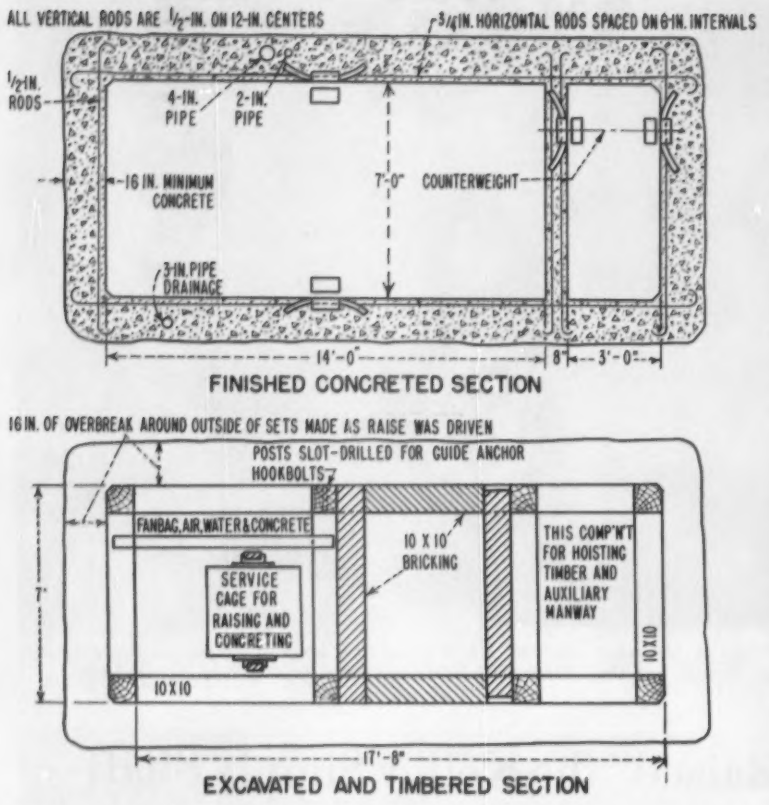
1. Posts adjacent to the divider wall provided side support for one side of the divider forms.

2. Posts dividing the two larger compartments fall on the line of the cage guides and provide support for the cage guide anchors during concreting.

3. Wall plates are jointed so that they may be hoisted in the small compartment, and the joint is in line with the cage guides.

Thus, the center compartment, when lined with 10x10-in. bricking laid skin to skin, was large enough for rock disposal. The South end compartment readily accommodated a cage with a 36-in. square deck, manway ladders and landings, air and water lines, and fan bag. Excessive space around the outside of timber contributed to instability of shaft sets installed without hanging rods. This was overcome by encircling each ring of timber with blocking stringers of 3x10-in. or 4x10-in. material to fit the ground. The stringers were also useful in controlling accumulation of loose rock behind the timber—an inherent characteristic of a raised opening.

Bricking was carried up as the raise progressed, and the head sheave of the service cage was raised on about 50-ft increments. The small North end compartment was kept open for timber hoisting, ventilation, and plumbing. A V-cut round consisting



BEFORE AND AFTER. Bottom plan shows setting of timber and overbreak required during raising. Top plan shows main compartments after concreting and timber stripping.

TUNNEL LEVEL STATION AFTER CONCRETING. Note cage for raising and concreting.

of an average of 78 holes and consuming 468 sticks of 45% powder was used. The cut was directly above the muck compartment and followed the firing of two inside rows of relievers. Cuts and relievers broke down onto a bulkhead of timbers covering the muck compartment. Rock from the balance of the round fell onto the inclined bulkheads raised with every blast so that all rock was diverted to center compartment. In one lift, a 6-in. pipe was carried through the inclined bulkhead over the cage compartment, and by attaching the fan bag to the lower end, smoke evacuation started immediately after the blast.

Sized Timber Used

Timber used in the sets was nominal 10x10-in. F2S, finished inside and outside to insure a uniformly accurate concrete section. Conventional shaft plate framing was applied to the corners, and the wall plate was jointed in line with the divider between the two larger compartments. This made it possible to raise the cage compartment alone in the few places where ground conditions would not permit opening up a large original area. The outside corners of the corner posts were beveled at 45 deg for a distance of 2 in. back from the corner to ease shrinkage tension of the concrete at that point.

Offsets Control Rock

As raising progressed, offsets were installed in the center compartment to break the fall of rock and to control its removal. These offsets were placed at intervals of not more than 150 ft, and, since the shaft size put the offset outside the shaft outline, the sites chosen coincided with future station locations wherever possible. In bad ground all bulkheading outside the shaft timber was separated from the shaft timber by a blocking space so that the 16-in. concrete wall could be carried through later without timber interference.

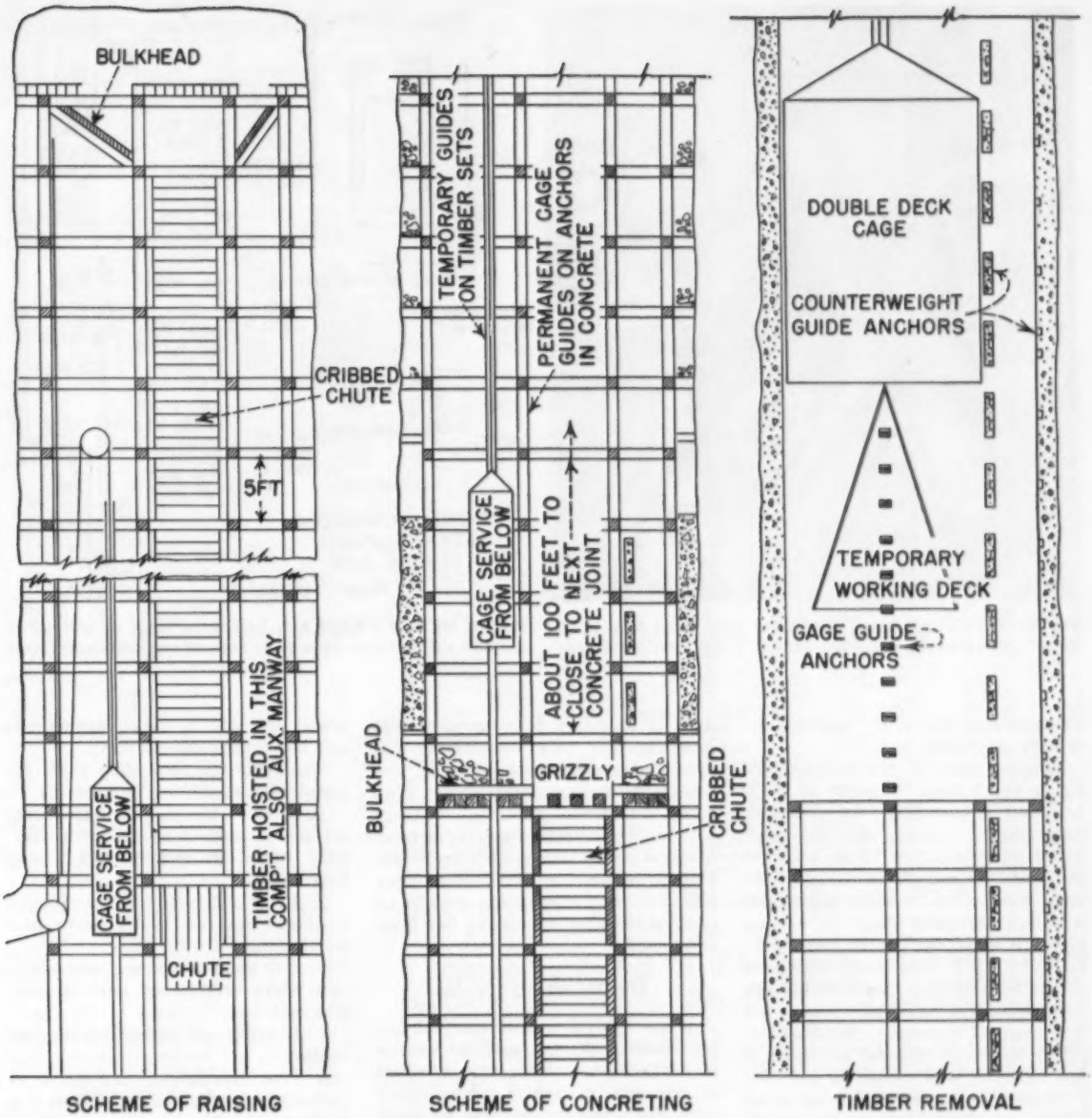
Fast Advance in Raising

The 4-man raise crew consisted of 2 miners in the top of the raise, one swamper who was either on the timber hoist at the bottom or else concerned with pulling rock through the chute, and the cage hoistman. Table 1 shows the advance made by the crews on the different levels.

The vertical interval of the raise sets was 5 ft so that divider occurrence would not interfere with the placing of guide anchors, each measuring 2½ ft. During raising it was noted that the distance between sets tended to increase slightly, probably because of imperfect joints between posts and plates. After considerable rock had passed through the muck compartment the drag of the passing rock tended to compress the timber by as much as 12 in. in 300 to 400 ft so that the plan of using pre-drilled, slotted holes for attaching guide anchors to the center post was about 50% disrupted. The 1-in. frame in the wall plates retaining the divider posts was not adequate to hold the pressure from the bricking in the muck compartment, and the posts had to be reinforced with nailed-on cleats.

Remarkable Survey Accuracy

Control was obtained by mine engineers who plumbed down each end of each set to targets set below and advanced upward by careful plumbing



THREE VITAL STEPS. The triple-level raising campaign had to be planned systematically for smooth coordination of raising timbering, concreting, and timber stripping cycles. See text for details of each step of the project.

so that the raise crew plumbed a maximum distance of about 50 ft. In all lifts, except the short one from the 800 to the 600, targets were set from surveys based on single-wire plumbings in other shafts. Note remarkable accuracies in Table 2. Timber was installed by the miners so accurately that when the sets were reblocked for concreting, the maximum movement in any direction was less than 2 in.

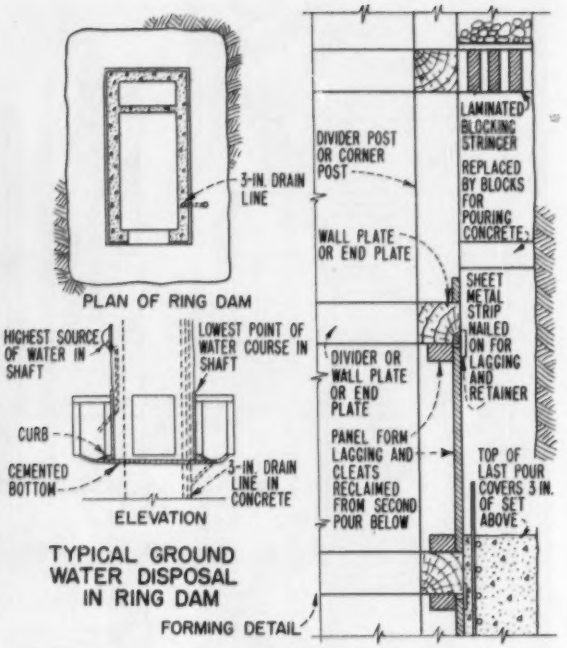
Water Control Problems

Concreting in the lift above the 600 level started immediately after the raise had been holed through to surface. Two water courses occurred in faults in the lift. Water had to be channeled into a drainage pipe before any concreting could be started below these watercourses and before the raise from the 800 to 600 level could be holed through. Drainage was established by driving a small drift around the shaft and placing the drift timber so that at a later date the concrete shaft wall occupied the space used for blocking the drift timber to the shaft sets. The floor of the drift was cemented on a grade around the shaft down to a single point where a floor drain leads the water to a pipe later concreted in the shaft wall. The 3-in. drain line discharges to atmosphere at all "ring dams" and levels, and the water is diverted to the mine drainage system at all haulage levels.

Concrete Design

Steel reinforcing of ½-in. and ¾-in. deformed bars is placed on the tension side only to withstand a safe stress of 1000 psi. Bars are tied in place by a Ty-Tite No. 5 pistol grip twister using 5½-in. long, 16-gage, soft black annealed pre-looped wire bar ties. Both devices are made by the St. Louis Steel Products Co. Reinforcing in the divider wall is pre-

SHAFT WORKERS install reinforcing rods. Read text, p 87, to find out about the pistol-grip twister which speeded the job.


PLAN OF RING DAM
3-IN. DRAIN LINE
HIGHEST SOURCE OF WATER IN SHAFT
LOWEST POINT OF WATER COURSE IN SHAFT
CURB
CEMENTED BOTTOM
3-IN. DRAIN LINE IN CONCRETE
ELEVATION
TYPICAL GROUND WATER DISPOSAL IN RING DAM
DIVIDER POST OR CORNER POST
WALL PLATE OR END PLATE
LAMINATED BLOCKING STRINGER
REPLACED BY BLOCKS FOR POURING CONCRETE
SHEET METAL STRIP NAILED ON FOR LAGGING AND RETAINER
DIVIDER OR WALL PLATE OR END PLATE
PANEL FORM LAGGING AND CLEATS RECLAIMED FROM SECOND POUR BELOW
TOP OF LAST POUR COVERS 3 IN. OF SET ABOVE
FORMING DETAIL

THESE DETAILS EXPLAIN how water rings were installed, and how shaft timbers were made to serve successfully as forms.

fabricated in halves by welding and is easy to install.

Original concrete mix was designed for a compressive strength of 3000 psi, and consisted of the following proportions: cement, 564 lb; sand, 1,580 lb; gravel plus ¼ in. minus 1 in., 1,650 lb; and water, 42 gal. Concrete is delivered by mixer truck from a central batching plant to a 4-in. pipe line in the shaft fitted into a 6-in. I. D. by 15 ft long heavy-duty hose at the bottom. This mix was too dry for trouble-free pipe line delivery and was changed to cement, 564 lb; sand, 1,500 lb; gravel plus ¼ in. minus 1 in., 1,600 lb; and water, 50 gal.

One pour covering 5 ft of shaft consists of about 22½ cu yd and can usually be handled in 2 hr with two mixer trucks, one man at the top of the shaft pipe line and the 3-man crew at the bottom. This amount of concrete indicates an average wall thickness of 24 in. Every effort was made to maintain a minimum wall thickness of 16 in. in excavating and without back forming. Pouring to ground without back forms places the entire perimeter in vertical shear; thus no bearers were required.

Progress Is Downward

While concreting itself progresses in an upward direction to close with any work above, the progress in general is from the top downward and all cage service to a given horizon in concreting progress is from above. This is necessary because no matter how carefully clean-down work has been done, some rock must be disposed during concrete work. With some exceptions, the usual distance to close out with work completed above is about 100 ft. This figure was chosen because it is the maximum safe distance for dropping rock in an open shaft after concreting has been completed.

The Working Cycle

When a lift has been selected, the previously concreted section above is cleaned down and the sheave wheel of any service cage is lowered to a point just below the new starting point or base. Bricking or "cribbing" is removed from the chute compartment and hoisted to the level above during the cleaning-down phase. The cleaning-down work is done for the entire lift of about 100 ft, or sometimes more, before the base is laid around the outside of the timber for the first pour. In laying the base, holes are bored through so that the regular pattern of vertical reinforcing bars project through for the benefit of the next closure pour from below. Boxes are provided on this base pour on 5 ft horizontal intervals for concrete disposal to all parts of the forms on the closure pour from below. A horizontal bulkhead and grizzly is installed at a horizon of one to two sets below the first pour of any lift for rock control and safety. In most places the side or panel lagging was left out after cleaning down.

The cycle for concreting a lift for about 12 man-shifts is as follows:

1. Remove blocking stringers from set above, jack set to line with tolerance of ¼-in. and re-block, using butt blocks.
2. Remove divider forms and panel lagging from two pours below and install divider form above.
3. Bolt guide anchors in place.
4. Place reinforcing steel in position and tie.
5. Install panel lagging, cleats, and braces.
6. Pour concrete.

Progress made in the different lifts is given in Table 3.

Pre-Fabricated Forms Used on Divider Wall

A pre-fabricated come-apart form made principally of 1-in. boards was devised for divider walls. The entire form is made of finished lumber, varnished, and bolted together. It is recovered about 48 hr after a pour for re-use. This form speeded up concreting operations.

Panel lagging which fits between wall plates and flush with the outside of the set was designed originally to have one end beveled to fit against a beveled retainer. Imperfections of mine timber, particularly after it has withstood the shock of blasting and has been in place for some time, rendered this plan impracticable and

Table 1. Advance Made in Raising

Period, 1953	Lift	Shifts	Ft of adv.	accum. ft of adv.	Remarks
Jan.	600 to surf.	291¼	74	253	
	1300 to 600	240¼	55	88	
	2000 to 1300	80¼	...	...	
	Total	611¾	129	341	
Feb.	600 to surf.	236¾	67	320	
	1300 to 600	83¾	59	147	
	2000 to 1300	80¾	31	31	
	Total	402¼	157	498	
March	600 to surf.	266¾	42	362	
	1300 to 600	137	53	200	
	2000 to 1300	164¾	57	88	
	Total	568½	152	650	
April	600 to surf.	264¾	54	416	
	1300 to 600	183½	52	252	
	2000 to 1300	372¼	81	169	
	Total	820¼	187	837	
May	600 to surf.	274	65	481	
	1300 to 600	191½	66	318	
	2000 to 1300	303½	90	259	
	Total	769	221	1058	
June	600 to surf.	238¾	67	548	
	1300 to 600	285¼	50	368	
	2000 to 1300	304¼	89	348	
	Total	828¼	206	1264	
July	600 to surf.	283¾	37	585	
	1300 to 600	309	67	435	
	2000 to 1300	320½	80	428	
	Total	912¼	184	1448	
Aug.	600 to surf.	249¾	44	629	*Inc. 41 ft on 800
	1300 to 600	351¼	*104	539	
	2000 to 1300	364¼	83	511	
	Total	965¼	231	1679	
Sept.	600 to surf.	260¼	51	680	Holed
	1300 to 600	413	*115	654	*Inc. 53 ft on 800
	2000 to 1300	321	60	571	
	Total	994½	226	1905	
Oct.	600 to surf.	.....	...	680	
	1300 to 600	387½	*115	769	*Inc. 55 ft on 800
	2000 to 1300	337¼	74	645	
	Total	773¾	189	2094	
Nov.	600 to surf.	.....	...	680	
	1300 to 600	160½	*15	784	*Inc. 15 ft on 800
	2000 to 1300	300½	23	668	
	Total	461	38	2132	

Table 2. Target Closures

Lift	Distance ft	East North end	West South end	North-South
600 to surf.	680	½ in.	0	½ in.
800 to 600	181	0	½ in.	½ in.
1300 to 800	620	0	¼ in.	¼ in.
2000 to 1300	668	¼ in.	¼ in.	½ in.
	2149			

Table 3. Concreting Progress

Period	Lift	Shifts	Ft	Cu yd	Accum. ft
Oct. 1953	600 to surf.	354¾	62	235	62
	Total		62	235	62
Nov.	600 to surf.	468	90	412½	152
	2000 to 1300	27¾	...	.....	....
	Total	495¾	90	412½	152
Dec.	600 to surf.	481	70	361½	222
	1300 to 600	3¾	...	.....	....
	2000 to 1300	240½	60	224	60
	Total	725¼	130	585½	282
Jan. 1954	600 to surf.	385¼	80	378½	302
	1300 to 600	289	60	254	60
	2000 to 1300	289	45	222	105
	Total	963¼	185	854½	467
Feb.	600 to surf.	583¾	95	452½	397
	1300 to 600	545¾	75	369	135
	2000 to 1300	299¼	70	314	175
	Total	1428¾	240	1135½	707
March	600 to surf.	371¼	65	298	462
	1300 to 600	610	215	949½	350
	2000 to 1300	73½	...	.....	175
	Total	1054¾	280	1247½	987
April	600 to surf.	323	85	393½	547
	1300 to 600	368¾	107	442½	457
	2000 to 1300	.....	...	.....	175
	Total	691¾	192	836	1179

square cut lagging with a clearance varying from ½ to 1 in. has been used. The standard retainer finally adopted was a flat strip of sheet metal nailed on the outside of the wall plate. It is not recoverable. The unit also prevents concrete leakage. Each pour is carried up to a point 2 to 3 in. above the top of the wall plate above. This blocks the bottoms of the posts for the succeeding pour and also provides a concrete retainer for the bottoms of the panel lagging of the succeeding pour.

Vibrator Settles Concrete

Concrete is delivered from the 4-in. pipe line to the forms through a heavy-duty 6 in. I. D. hose which slips over the end of the pipe. As the pour progresses, the hose is moved from one side of the shaft to the other to keep a uniform hydrostatic head. A pneumatic vibrator forces the mix to flow around all fixtures and reinforcing without voids. The vibrator must be used with care in wood forms to prevent leakage and movement.

Engineering Control

Three plumb lines are used in jacking the sets to line to insure plumb location and square. A tolerance of ¼ in. is the maximum permitted in bringing the timber to line, corresponding roughly with expected ability to measure to a timber surface more or less rough and not perfectly straight. One man from the engineering department has been assigned to the auxiliary shaft job, and his OK is required before a pour is made in any lift. He also provides marks for the location of guide boxes. This is done to meet the following conditions:

1. No guide box may fall in line with a wood divider.
2. Guide boxes are placed exactly 2½ ft apart so that few odd length guides are required.

Conclusion

From the Kelley mine records of raising shafts it appears that the distance limit of raising in ground good enough to stand over three or more compartments is in excess of 700 ft, and probably is determined by the wearing effect of passing the rock through the chute. Positive control of broken rock flow must be maintained at all times. It is possible that the main advantage of using shaft timber, in place of steel, for forms lies in the instance where such bad ground conditions prevail that the timber removal for installation of the steel form could not be tolerated. The advantages of using steel forms are as follows:

1. Far greater precision is achieved with less engineering supervision.
2. Less leakage of water and cement and consequently a little stronger concrete.
3. Finished surface has neater look.
4. Timber is removed before concreting and with less work than after concreting.

The author wishes to acknowledge the cooperation and aid given by R. P. Corbett, William Norem, and John Killoy in preparing the aforegoing article.

Carroll L. Wilson

A Rumbling on the Plateau

MOST SPECTACULAR postwar development in domestic mining has been the fabulous growth of the uranium industry. Five years ago, the U.S. was mining only about 10% of the Free World's uranium. Today, as a result of the AEC's effective incentive program, thousands of prospectors and miners are placing the nation in contention for the title of the Free World's leading producer.

But uranium ore in the mines, or above ground, is not enough. It takes concentrates to feed the AEC's great diffusion and plutonium plants and there are those who think that construction of mills to produce those concentrates is lagging seriously. The fact is that mined uranium ore is piling up on the Colorado Plateau. What's wrong? What can be done? These are questions with as many sides as there are groups concerned: prospectors, miners, millers, would-be millers and the AEC itself.

A Course of Action

AS A STEP toward clarification and, perhaps, solution of the problem, E&MJ has interviewed Carroll L. Wilson. We asked Mr. Wilson for his opinion because of his broad experience on two sides of the controversy as the AEC's first general manager and as a uranium mine and mill operator: Because he can be objective in his observation since he has severed all ties with the industry: And because he so lucidly outlined the problem in a talk before a special meeting of the National Industrial Conference Board in October.

It is your industry and your problem, we therefore invite your comment on the definition of the problem as well as the solution proposed.

E&MJ Interviews Carroll Wilson:

There is only one purpose in publishing this article—to promote frank and open discussion of a problem that besets an important segment of our industry. As a start you will find some frank answers (in lightface type) to E&MJ's questions on the subject. **The Editors**

Mr. Wilson, it is certainly a pleasure for E&MJ to be your host here today and we are looking forward to shedding some light on the bottleneck in the milling of Plateau uranium ore. We are particularly pleased because your qualifications seem to be unique, having had experience both with the Atomic Energy Commission and with private industry on the Plateau, and because you are now out of the business and are in a position to take an objective view. Just for the record, Mr. Wilson, would you tell us how long you were with the Commission and how long you were with Climax Uranium?

I served as general manager of the Commission from December 1946 until Aug. 15, 1950. From May 1951 until June 1954 I was with Climax Molybdenum Co. and during most of this period was president of the Climax Uranium Co. I am now vice president and general manager of Metals and Controls Corp.

At this point, I would like to say a few things about criticism. The administration of the AEC is an extremely difficult and complicated task. Today we are going to be talking about the raw materials field and, in much of this, I think the record of the AEC is excellent and special credit is due to Jesse Johnson, who has been in charge of the program almost from the beginning. There are some really tough problems of public policy involved in this area of the AEC operations which has the most extensive business relationships with the public. In criticizing the AEC, as I may do in our discussion, and in making some suggestions, I offer these in a constructive spirit and with full appreciation that there are no easy answers. At the same time, I do recall that some of the constructive things which were done when I was in the AEC were in response to a healthy pressure of public opinion for examination of the way we were doing things as a basis for modifying our practices and doing the job better.

One further thing I should say before we begin. Whatever authority I may have to speak on these subjects presumably derives from the fact that I have been both in the Government's role and in the mining company's role

What Can Be Done About The "Uranium Milling Bottleneck?"

and now I am in neither. This position provides me with detachment but, at the same time, lack of intimate familiarity with the current state of affairs, for I have been away from this business since last summer.

A good place to begin is with the question—is there really a bottleneck? And whose bottleneck is it, Mr. Wilson?

A bottleneck implies that there is some restriction in the flow from the ground into the AEC plants which use uranium as feed. As we all know, uranium concentrate is the product the Commission needs to buy as feed for the diffusion plants and plutonium plants. The bottleneck, as I see it, lies in the shortage of milling capacity to convert the uranium in Colorado Plateau ores into a concentrate usable by the Commission in its program.

Anyone who has been on Plateau has seen those piles of ore at the side of the mill, which certainly give the miner a feeling that there is a bottleneck. How about the other side? We cannot go into classified materials, but how do we know that diffusion plants aren't getting all the concentrates they need?

Evidence of a shortage of milling capacity can be gained from the Commission's own statements. A year ago the AEC considered the bottleneck sufficiently serious to ask Congress for $12-million to build Government-owned milling facilities. General Nichols, then general manager of the Commission, told the Senate Appropriations Committee, and I quote the statement—"Actually, we have slowed down recently in trying to get the ore above ground because we are so far behind in the construction of processing plants."

Jesse Johnson is reported by *The Denver Post* to have told the Western Mining Conference recently that in the four years between July 1, 1950, and July 1, 1954, ore was being delivered to the mills 37% faster than it was being processed. In addition to the ore being stockpiled at the mills, huge stockpiles have been built up at the AEC buying stations.

Johnson also said that it may be necessary to slow down mining production for a while by scheduling mining in the Monticello and Moab areas, places where large new discoveries have been made in the last two or three years, and where there has not been a commensurate building of milling capacity.

Certainly new discoveries create a milling problem. But in general, uranium is a business that has characteristically not built huge ore reserves. How much can you afford to invest in a mill whose success will be based on discoveries not yet made?

Let us go back to the origin of the program which has been so successful in bringing about the search and discovery and mining of ores. In 1948 the Commission was faced with this sort of problem:

Mining of uranium ores in the Plateau was practically at a standstill. Reserves were uncertain. There were only two mills operating at partial capacity; two mills were completely shut down—Uravan and Durango. The major problem then facing the Commission was not milling capacity, but providing a structure of incentives and certainty which would encourage people to get out and look for ore, and be assured they had a market for the ore if they found it. It was against this background that the schedule of guaranteed prices for uranium and vanadium in ore, haulage allowances, development allowances and so on, was formulated, and announced publicly for the first time about the middle of 1948.

At that time the problem of milling capacity didn't exist. There was twice as much capacity as there was ore, and frankly, as I remember our problems at the AEC in those days, we gave relatively little thought to the structure of incentives that would lead people to build new mills. Contracts negotiated during the war were confidential, and the general pattern of the wartime contract was picked up when the AEC made agreements with USV and VCA to resume milling operations. Incentives for search, discovery and mining have in fact, produced a great deal more ore than the milling facilities can process. I think we are still living with the inheritance of that unbalance.

(*Continued*)

White Canyon ore-buying station: How much ore will it take to justify a mill?

To get back to this reserves problem, actually uranium can be piled up in front of those mills indefinitely, can't it?

There is plenty of room out on the Plateau, I'm sure.

Then, just taking a hypothetical case—an area or a given district could be mined out and that ore just left on top of the ground until a mill was economically justified. It might take years. How badly would uranium be needed to consider building a mill before ore reserves justified its construction?

I accept the AEC statement that they are very much in need of uranium concentrates. And it is concentrates "in the can" which will serve their purposes. Merely to have the ore above ground with Government money tied up in it as inventory does not provide feed for Oak Ridge, Paducah, Portsmouth, Hanford or Savannah River.

Fine. Well then let's get to the present system of negotiating for building new mills. It seems that there is a pretty widespread expansion going on here; is it your feeling that it's not fast enough?

Let us consider the major ore discoveries in the last two or three years, and see what has happened in terms of milling capacity.

First let's take the New Mexico area down around Grants. Here Anaconda, which has extensive mining properties, has also built a mill. I'm not aware that a real problem exists there, because they have an integrated operation. But let's take some of the others. Certainly in the Moab district there have been striking discoveries, perhaps the outstanding discoveries on the Plateau. The dimensions of Mr. Steen's property have probably been known for a couple of years; certainly since the summer of 1953, yet no mill has been built, nor even started. Not too distant, Mr. Pick not long ago sold his property and though, as in all these cases, the reserves aren't described, nevertheless the price he was paid implies that this was a large property. No mill for that one either. In the same area there is the Happy Jack mine which again is rated, I believe, as one of the outstanding deposits. It has come into production in the last two or three years and there is yet no mill for that. Likewise in the rest of the Moab district, there are at least a half dozen existing producing properties and yet there has been no mill specifically built for these ores. The same is true around the Jo-Dandy area.

In the same period of two or three years I believe there have been mill expansions, or expansion programs are under way, at Uravan, Naturita, Durango, Monticello and Grand Junction. But none of these are in the Moab district. They are anywhere from 50 to 100 or more miles away.

Anaconda is certainly a good example of an integrated operation, but to take another example, how about Mr. Steen's property? It seems with the reserves that he has there, the way is open for an integrated operation. What could the AEC possibly do to speed construction of a mill in that area?

Well, the AEC faces a difficult policy question in connection with a large property from which it is accepting ore shipment and from which it really wants concentrates. The AEC is not obligated to take more than 1,000 tons a year of ore from any single deposit. At present, they generally take all that is offered and there is no very real incentive for the miner to build a mill, providing he can ship his ore to the AEC in whatever amount will serve his purpose. And since there is very little capital risk in the mining operation as compared with milling, it is frankly much more convenient for him merely to ship ore to the AEC and be paid upon delivery.

The incentives to him to find capital—to merge his interests with people who have the amount of money and know-how to build a mill—are very small. So one of the policy questions the AEC faces is whether it will invoke Circular 5 and not accept more than 1,000 tons a year from a miner. This, it seems to me, might substantially speed up the process of the miner finding a partner with money and building a mill.

How does depletion fit into the picture? If a mine owner could produce a concentrate from his own ore, and get paid, say $12 a pound for uranium in it, as opposed to a figure of perhaps $7 per pound of uranium in his ore, and thus figure depletion on $12 instead of $7, isn't there a big enough saving in there for him to profit by building a mill?

Taking it on a straight depletion basis, yes. But let's consider his position as a miner. He may invest a hundred—maybe two hundred thousand dollars to develop and mine that ore. That's the extent of his capital risk. If his property is at all valuable, he can recover that much in a short time. On the other hand,

a mill may cost him $10,000 to $15,000 per ton of daily capacity, and something like 200 tons a day is the minimum economic size for a mill. So take the $15,000 figure —that is probably not too far wrong. That's $3-million capital for a 200-tpd mill. Now the working capital is at least another million. That means he must have $4-million as against only $200,000. The depletion argument doesn't make enough difference, I think, in most cases, to offset the independence of the miner and his very small amount of capital at risk.

Let's go back to the steps we were taking. One of the possible solutions for the AEC was to invoke this minimum acceptance clause in Circular No. 5.

It is a form of pressure that they can exert to move private property owners into getting a partnership with a milling outfit, or with milling capital.

What other alternatives are there?

Well, I don't mean to underrate the AEC problem; having sat on that side of the fence for some time, I am aware that this is a matter of balancing difficult choices. The AEC under the present system not only has to negotiate a contract for milling, but it has some obligation to see that the miller gets ore, either from Government-owned mines or independents.

The AEC has to negotiate a tailored solution for each milling setup. It inevitably becomes involved in every aspect of the milling operation. And it is put under pressure by Congress that nobody should get rich in milling. Everyone applauds a bonanza for the miner or the prospector, but the pressures of public opinion against anybody getting rich in milling are heavy.

The AEC also has a conflict of interest in the sense that they have their own mill. They do a lot of research on processing. They are the customer, and also the controller of a lot of the raw material. They can't be entirely neutral and objective. One of the suggestions I have made is that the formula—or something like the formula—that was so successful in bringing about search and discovery of ore; that a schedule of guaranteed prices over a period of years be considered for concentrate in the hope that this might provide a framework within which private enterprise, miners and millers would get together to furnish concentrate for the AEC on general ground rules similar to those found in other metal industries.

Wouldn't such a formula increase the cost of uranium for the taxpayer?

I'm not sure that it would increase the cost to the taxpayer. Obviously the prices could not be set at a level which would provide a good return for the highest cost mill. A level would have to be set some place between the lowest and the highest cost. So that this might well mean that marginal plants in time, on the expiration of their current contract, let's say, would have to drop out. There would have to be a transition period in moving from present arrangements to full dependence on fixed prices.

If you are going to have fixed prices, you are going to have the working of economic laws which eliminate the marginal and weak and reward the efficient and strong. Whether in the long run this would cost the taxpayer either more or less money than nursing along every producer, including the most marginal is a question.

Then wouldn't this competition, by closing the marginal mills, reduce total milling capacity so that despite any gain made by people who are competent, the overall result would not necessarily provide a net increase in milling capacity?

This is a matter of opinion—how it would work over a period of two or three years. I think the existence of a definite framework where people can make their own decisions, where they can expect to keep the profits that they make, would encourage building more capacity where it is justified as a business risk. One of the discouraging aspects today is that almost everybody is getting to know that under the present system and pressures the AEC cannot really permit anyone to make much money more than a "low risk" profit in milling.

According to AEC officials at Grand Junction, a great many people seem anxious to get into the milling business. Apparently the "reasonable profit" system that the AEC is now working on (cost plus a "reasonable profit") seems to be entirely satisfactory.

The real test is how many signed contracts there have been for new milling facilities in the last two years. This, I think, is the only real yardstick—not a qualitative statement as to how many people are eager to go into the business.

How would a fixed price formula for buying concentrates, handle the many variables, such as high lime, mineralogy of the ore, and location of the mills, and remain workable?

Well, this isn't easy. On the other hand, setting up the existing formula for ore prices presented difficulties. A schedule of fixed prices for concentrates would have to be geared to average grade of heads. The cost of milling is primarily based on tons milled, rather than on pounds of concentrate produced. The schedule would have to take account of some of the metallurgical variables. But I think that a study of some of the other fields of activity on which there are schedules or prices for metals, suggests that somehow these matters can be overcome.

It seems to me that a study of these other fields might well reveal how a consistent pattern can be developed so that you can have two price structures; one for ore and one for final concentrate. I don't at the moment know enough about these other fields to say precisely how you can mesh present Circular 5 with a schedule for prices of uranium concentrates. I believe it should be possible because it has been done in other fields.

Because of the many metallurgical variables, how much umpiring would the AEC be called in to do? Wouldn't it involve almost the same setup, metallurgically, as they have now? For instance, there's a penalty for high lime. In one mill high lime is no problem, but in another mill it is a problem. Wouldn't high lime ore tend to flow to the mill which has no penalty on it?

The ore prices now provide a penalty for lime content. When a mill buys 7% lime ore, the price of that ore bears a penalty so that there is a built-in adjustment and I'm not sure that in the concentrate price this needs to be taken into account.

Now there are differences in the amenability, but obviously you must have a circuit that will handle the types of ore from the district on which you have to draw.

If mills are making a "reasonable profit" and are protected against these complicated variations in feed, aren't they just as well off getting a secure profit as they would be with a fixed price for concentrates?

(*Continued*)

Again I come back to the yardstick. If this were a happy, attractive setup; if there weren't something wrong with the picture, why is it the AEC has been crying for the last two years for more milling capacity and very little has been built? It seems to me that we come back to the facts of the situation. There is something unsatisfactory about this whole thing.

Perhaps AEC officials are leaning over backwards to keep from having private interests invest a lot of money in a mill when there is no telling how long that mill can be operated at a profit. They try to do everything they can to be sure that he has an ore supply.

Cases have been reported where ore was hauled past one mill to another mill much further away from the mine, simply because the more distant mill needed ore of that character and that grade and was willing to pay more for it. This, in effect, is competition with the nearby mill. Well, the AEC apparently is trying to avoid that situation, and it seems reasonable for them to want to protect the people they have been dealing with.

These are problems of a managed economy. If you get into this part way, you get into it all the way. And you might as well end up by the Government building the mill and paying a fixed fee, or offering a sliding-scale incentive system.

Could we summarize that under the present system the mill man cannot make enough money to justify his risk; under another system he could make more money and therefore his risk would be a more reasonable one?

That's right. There is a basic principle in business, for high risks—high rewards; for low risks—low rewards. Now you can do a completely low-risk job and the Government can build the mills and you can have fixed fee contractors and you get none of the motivation of the private enterprise working. It works out all right in certain cases. The AEC runs Hanford that way; they run Oak Ridge that way, but it is not private enterprise.

Assuming for the moment that the AEC did establish a formula for pricing concentrates, presumably the price would be pretty close to what they are now paying. Therefore, would the chief gain to the mill man in establishing this formula be an incentive to improve his metallurgy?

That's correct.

What are the chances of improving metallurgy so vastly that the miller can substantially increase his profits?

I think the chances are very good. This art is at a very primitive stage at the present time. Sure, there has been a lot of work done in the last few years, but in terms of the technology of the processing of ore, there is a high state of flux.

And I think the important factor is motivation. There are all sorts of technical opportunities for improvement and for a tight, firm operation where you make more money if you cut your costs, if you can do it in a way which is uninhibited, by sharing or negotiation or what not. This is the kind of incentive that works in most industrial setups.

You feel that technology would prosper more under this system than where the AEC guides all metallurgical developments?

Steen's Mi Vida: Two years' production and still no mill.

I do. The AEC has done excellent work, and I think they provide fine information in the field. But I think when it comes to the engineering design and operation of a plant, commercial firms who are in the business of making money can do it far more effectively than AEC and carry it far beyond where the AEC has carried it.

How much of a factor would security regulation be in development of technology by free enterprise?

Security barriers are not serious at the present time. A great deal of this information is in the public domain and I don't believe that secrecy barriers are going to be an obstacle.

We certainly have talked considerably about what's wrong with what is going on now. Do you have a solution to some of the pressing problems?

It seems to me that we have identified some of the facts. I am sure there are many more. The full candid presentation by the various milling companies of the problems and solutions that they see, a similar review of the problems of the miner, and his relationship both to the AEC, with the milling companies, as well as the problems that confront the AEC itself, would add much more than we have identified here.

Briefly, what are some of these other problems that you have in mind?

Well, take the AEC's problems. It has a series of difficult choices. We have identified some of them here. Shall it invoke limitations on the purchase of ore, therefore loosing a hornet's nest of independent miners running to their Congressmen and jumping on AEC, or, shall it just allow the ore to pile up indefinitely at buying stations, and therefore, exert no pressures on the mine owners to do something about milling their ore? That is one of the problems.

Another one is how does the AEC reconcile its use of Government money to finance a search for ore with the need to prevent anybody from making any money in the milling business? It has to negotiate recapture

clauses and what not in its contracts, so that if there were a bonanza of technical developments it wouldn't be found paying so much to the miller that he would make a lot of money. There are administrative problems. There is the fact that it has its own mill.

Then there are the milling companies—what have they done, what are the inhibitions they now have, why aren't they doing more, can they get together with people who own mining property? What is their No. 1 problem, what ideas do they have for a solution to this, which will be in the public interest and yet will unleash far more of the normal competitive drive than is being put to work in this business today? These are some of the kinds of things that need to be found out.

How would you do this?

I suggest that the AEC consider a path which I know has been very successful in other cases: To appoint a carefully selected board of review or panel, to listen to, to examine, to hear the evidence of all of the parties, and to make some specific recommendations to the AEC as to courses of action which will reconcile in a sound way these various conflicting interests. I suggest this because I know it has worked well in the past. Some years ago, I served as the secretary of the board of consultants in the State Department, and prepared the first plan for the International Control of Atomic Energy.

Now *there* was a tough problem. It was January and we were facing the meeting of the first session of the UN-AEC in June. Nobody had a solution. What was done was to select a board of consultants, five people, who would take the time to dig into and develop the facts and to come up with some specific recommendations. This practice has been successful many times, but it hasn't been done by the AEC in the field of raw materials.

I doubt that the Joint Committee of Congress is the best body to do this. The Joint Committee is a good fact-finding body, but is primarily concerned with legislation. This is not a subject that calls for legislation. This calls for a study of the problem, an opportunity for all the parties that are interested to be heard. It needs deliberate and thoughtful analysis by an objective outside group examining a difficult problem which confronts the Government. Surely the AEC could get the right sort of people to serve on such a group. They would bring to these problems their collective judgment and could recommend a course of action to the AEC which would be defensible from the point of view of the miners, the milling industry, Congress and the public. This, I think, is overdue.

Who would be the members of this board? In the past, we in the mining industry have felt such bodies are apt to be less than helpful because no matter how well intentioned, they may not understand the mining industry well enough to decide upon an issue that will have a lasting effect on the industry.

This is a problem of the public interest, of the national interest in terms of the supply of uranium. Obviously it requires some specialized knowledge, but after all, our courts are dealing every day with problems as difficult as this. Take the task given to the President's Materials Policy Commission. There was a board of five people of whom only one was a raw materials man. Its findings have been widely criticized in the mining industry because it didn't have more such people on it, and it took a number of stands on issues that were unpopular with the mining industry. I think it was a study by a group of people who could bring to it more than a specialized knowledge. They dealt primarily with the interests of all the people: not with the special interests of one group. I think they made a great contribution.

I believe that this review board is a useful device. In Britain and Canada it is called a Royal Commission. Here it doesn't have to be given that dignity, but I think that there are people of experience in business and government, and public affairs, who could grasp the issues involved. They could weigh the evidence, and attest to the validity of the various conflicting points of view and come out with something which, from their absorption of the facts, but their detachment as individuals, would be better than the product of any group of specialists.

In our case, what type of people would be on it?

I would say that undoubtedly experience in mining would be important in one member of such a board, but I am thinking of businessmen, lawyers, government folk, professional people. We want a group of citizens who are accustomed to digging into strange situations. Lawyers frequently have to do that. This is a task for "generalists" rather than specialists. I don't have in mind a specific composition. I'm sure if a decision were made to appoint such a body and give it a broad directive to analyze the facts, that very good people could be found.

To pinpoint it, what would be the outcome of this board's work?

It might be an administrative practice; it might be the setting up of fixed prices after much greater examination of the consequences and how to do it than I have been able to give. It might be that the thing to do is to have the mills built and run on a sealed-bid basis, a system which AEC has not used. That would mean setting up definite public specifications for a job, then inviting sealed bids and awarding the contract to the lowest bidder —this is something the AEC hasn't done.

By an impartial evaluation of the points of view of the several groups most involved, such a board could shed some light on the whole problem which none of the interested parties can do alone.

What other accomplishments could we look for from the investigating commission, this "Royal Commission"?

Another reason for suggesting a step to bring this thing out into the open is that I'm sure that there is a great deal of unhappiness on the part of the millers. They are reluctant to voice it because the AEC is their only customer, and they are negotiating with the AEC and they are beholden to the AEC for all sorts of things. So they have lots of gripes, but they don't state them publicly. They state them privately, and this is not healthy. AEC, on its part, has plenty of complaints against the millers, plenty of suspicions about them, and yet they don't say much about those either. They just kind of "ferment," as do the gripes of the millers. The same is true of the miners. They are more articulate, less restrained. They, too, have various complaints which you hear at a Mining Congress meeting, or a Colorado Mining Association meeting, where people get up and they do say a certain number of things that are on their minds. You don't very often see any milling company getting up, though, and complaining—at least I don't remember any. It doesn't mean that they don't have complaints, but they don't dare voice them. This is unhealthy. It doesn't help AEC, it doesn't help the program. I think a study such as I have proposed would be a way of airing these points of view with a constructive purpose which is over and beyond just a gripe session.

EASILY HANDLED, Akremite (right) and primer (left) are both packed in polyethylene bags, eliminating headaches.

EASY TRANSPORTATION right to the job is possible because mixed Akremite is not sensitive to handling.

"Make-It-Yourself" Explosive

HAROLD DAVIS
A. E. FLOWERS
Associate Editors, *Coal Age*

AKREMITE, a new blasting medium recently developed by Maumee Collieries Co., Terre Haute, Ind., is already cutting costs and improving safety and efficiency at strip mining operations of four coal companies. Made from commercial-grade ammonium nitrate and carbon black, both commonly available materials, Akremite can be prepared on the job, eliminating the cost of transporting fixed explosives.

The idea for Akremite came out of the theory that it should be possible to use ammonium nitrate as an explosive with only minor additional processing.

Although ammonium nitrate in its normal commercial-grade form is not an explosive material, it is known to be the chief ingredient in many more expensive explosives. It is common knowledge that ammonium nitrate containing less than 1½% moisture, while apparently not cap sensitive, can be detonated by an adjacent primer charge of a cap-sensitive explosive. In the past this practice has produced a mediocre explosive effect which is improved when an oxidizable material is mixed with the ammonium

AKREMITE, made of low cost materials, is not cap-sensitive but is an effective explosive developed by Maumee Collieries Co., Terre Haute, Ind.

R. L. AKRE of Maumee after whom the new explosive has been named.

MIXING AT THE MINE of cheap-to-ship ingredients, ammonium nitrate, carbon black, is standard practice.

GOOD FRAGMENTATION with Akremite has meant greater number of payload swings for the draglines.

Shatters Blasting Costs

nitrate because more gas is produced.

Early experiments at Maumee revealed that when carbonaceous material of the proper character was added to ammonium nitrate, it was possible to detonate the mixture completely if a granular, non-caked charge was tightly packed in a flexible package, then placed in a blasthole in such a way that all air pockets were eliminated. With tight stemming, the ammonium nitrate mixture could then be detonated by a primer charge.

Maumee patents (March 8, 1955) cover all details and applications involved in using Akremite, including preparation and use of an effective primer charge developed for license.

Tested side by side with 20 other overburden explosives, Akremite in all cases produced good fragmentation at lower cost.

More than 8-million lb of Akremite were shot without misfire or other mishap at Maumee's three mines during the trial period. Total cost of materials, mixing, packaging and delivery of Akremite to the pits was less than 6c per lb. Ammonium nitrate, the principal ingredient costs about 3¾ per lb f.o.b. manufacturer's plant, and other ingredients need not cost more than this. Materials may be shipped at ordinary commercial freight rates rather than the higher fixed-explosive rate.

According to Hugh B. Lee Sr., Maumee president, the cost to a licensed user who mixes his own Akremite should be approximately one half the average cost of delivered fixed explosives. Maumee is exploring the possibilities of a licensing arrangement permitting industry to employ the Akremite process in either of two ways: (1) purchase of low-cost Akremite-type package mixtures from established explosive manufacturers, or (2) manufacture by the consumer himself.

Conventional loading techniques are used.

Procedures in the use of detonators, detonating fuse, connection and delays are those employed with fixed explosives. Any number of holes may be charged as drilled and detonated as desired since the packaged mixture is stable and moisture-proof. Polyethylene sacks are used for packaging. which will expand into the blasthole to exclude energy-wasting air pockets.

On-the-job mixing and packing of Akremite is simple.

Prime consideration is that the mixing plant should be close to the point of use to minimize haulage. Stability of the materials and the finished mixture permits such a location, and the equipment needed is inexpensive.

Safer shooting is possible with Akremite.

Since neither the materials alone nor the Akremite mixture is cap sensitive, all are safer to handle, store and transport than most other explosives. Furthermore, Maumee officials feel certain, although there has been no experience in the matter, that unshot Akremite in the bench will constitute less hazard to digging. And using the primer package developed for use with Akremite eliminates the headaches which sometimes result from handling unwrapped gelatin dynamite.

Credit for development of Akremite goes to Mr. Lee, R. L. Akre, Maumee's superintendent of drilling and shooting, after whom the new explosive was named, and to David W. Aten, vice president and secretary, and Lafe Stewart chief engineer.

"Results achieved with Akremite have exceeded our expectations," says Mr. Lee. " . . . Therefore we are licensing to other strip-mine operators the right to employ our Akremite methods at a modest figure which covers our instructions and training in compounding, packaging, handling, loading and shooting, and our continued advice and consultation."

Turn the page to find out about four case histories describing the application of Akremite and its results at four mines.

Case History No. 1

MINES: Chieftain No. 20, Riley, Ind., and Sullivan No. 27, Linton, Ind., The Maumee Collieries Co.

SHOOTING RESULTS: Blasting ratio, Mine No. 20 (hard dolomitic limestone in bank), varies from 3.30 to 4.63 cu yd of rock per lb of explosive, depending upon character of overburden. Mine No. 27 ratio, with solid sandstone in bank, varies from 2.26 to 3.40 with changes in the overburden.

Better fragmentation increased the yardage handled by 8% at Mine No. 20 and 13.2% at Mine No. 27, as noted in Table I.

Akremite used pound-for-pound in replacing the former blasting agent. Bank-measure volumes calculated from survey data. Hours of actual digging determined from the graphs of swing recorders on the draglines. Number of pay swings shows corresponding increase and bucket-utilization factor is improved since better fragmentation permits faster, fuller loading.

Increase in dragline efficiency has been sustained, as shown by cycles-per-hour averages for the 6-mo period September 1954 through January 1955, using Akremite, over the fiscal year ending Aug. 31, 1953, using fixed explosives. Mine No. 20 increase was from 80.34 to 84.46 cycles per hr of actual digging; at Mine No. 27, from 75.99 to 80.87 cycles per hr. Furthermore, easier digging as a result of better fragmentation has led to improved maintenance as shown by reduction in digging delays expressed as a percentage of running time. At Mine No. 20 the current figure is 14.49% against 20.52% for fiscal 1953. At Mine No. 27, digging delays now are 16.07% of possible running time, against 18.26% in 1953.

Table 1—Overburden Removed, Cubic Yards per Hour of Actual Digging, Maumee Collieries Co.

	Mine No. 20 1150-B Dragline 25 Cu Yd		Mine No. 27 1250-B Dragline 30 Cu Yd	
	1953 Explosive A*	1954 Akremite	1953 Explosive A*	1954 Akremite
April	1,286	1,489	1,593	1,930
May	1,419	1,411	1,704	1,687
June	1,455	1,531	1,252	1,627
July	1,450	1,630	1,978	1,946
Average	1,403	1,515	1,632	1,798

*Weight strength, 65%.

Maumee No. 20 Practice

OVERBURDEN: Average thickness, Mine No. 20, 51 ft, including two layers of hard dolomitic limestone interbedded with sandrock and shales. A layer of tough black slate, which is usually about 2 ft thick, lies immediately above the coal.

DRILLING: Bucyrus-Erie 50-R drill, making 10⅝-in. vertical holes. Blasting crew includes drill operator and two shooters on each of two drilling shifts and preparation foreman who laps both shifts. Drilled footage averages in excess of 100 ft per hour.

CHARGING PLAN: Blastholes drilled down to the coal to insure complete penetration of the tough black slate overlying the seam. Cushion of drill cuttings is dropped into hole to form a base for charge 6 to 12 in. above top of seam, insuring breakage of black slate without pulverizing coal. Primer is 20 lb of cap-sensitive explosive in polyethylene bag; Akremite also is handled in polyethylene, 50 lb per cartridge occupying 18 in. of height as confined in hole. Main charge in typical Mine No. 20 overburden is 100 lb of Akremite at bottom, then 20-lb primer, then 200 lb Akremite. Deck charge, for breaking top limestone is 20-lb primer under 50 lb Akremite. Primers made up by Austin Powder Co., and laced with Austin detonating fuse.

Drill cuttings provide excellent stemming, the shooters charging and tamping each hole as drill moves away to start next hole.

Blasting usually is done every 48 hr or at the end of a shift. Holes are linked through detonating fuse with ms connectors between rows and holes. Highwall blasts are made against 60-ft wide buffer of previously shot overburden for better fragmentation and fewer highwall slides. Delay interval between rows is 26 ms, between holes in row, 17 ms. A secondary tie-line links rows near center of the pattern to insure detonation of the blast.

Burden per hole is calculated at 25 cu yd per ft. Use of Polyethylene bag permits complete filling of hole, thus, less wasted explosive energy and more uniform breakage throughout cut.

Case History No. 2

MINE: Empire No. 6, DeBardeleben Coal Corp., Walker County, Ala.

SHOOTING RESULTS: A 25% increase in stripping rate resulting from good fragmentation plus heaving action of Akremite. Cost of breaking overburden cut to about half that of conventional explosives.

Akremite used from August 1954 to date totals 392,000 lbs with 1,140,000 cu yd of overburden broken.

Quantity of Akremite per cu yd of material varied according to the proportion of sandstone and shale in the overburden. Standards for loading are as follows:

0.3 lb per cu yd ..... 20% sandstone, 80% shale
0.35 lb per cu yd ..20-30% sandstone, 70-80% shale
0.40 lb per cu yd ..30-40% sandstone, 60-70% shale
0.50 lb per cu yd .....50% sandstone, 50% shale

OVERBURDEN: Blue shales and hard sandy shales, up to 60 ft thick.

DRILLING: Combination of vertical rotary and horizontal, or vertical only, using Quarrymaster vertical and Joy-Sullivan horizontal units. Vertical holes, 7⅜ in. on 18-ft centers; rows on 18-ft centers. Holes in diamond pattern. In combination blasting, vertical holes are bored on 15-ft centers at back of cut. Horizontal holes 6½-in. in diameter are centered between verticals and are drilled 63 ft deep, ending 12 ft ahead of vertical holes. Drilling patterns varied to meet changing conditions, with vertical holes predominating in hard material.

Three drillers and blasters handle mixing job, usually two days per week, mixing about 12,000 lb per 7¼-hr shift. Remainder of time these men work with three other drillers.

CHARGING PLAN: Vertical—3 bags Akremite in bottom of hole; next, 12½-lb 5x13-in. primer of 75% gelatine, followed by Akremite to within 20 ft of top of hole. Charge is topped by second primer and remainder of hole is filled with stemming. If the hole is more than 50 ft deep, a third primer is used. Horizontal—3 bags of Akremite at back of hole; next, 12½-lb primer, followed by Akremite to within 18 ft of the mouth of the hole, a second primer and stemming to the mouth of the hole.

With all vertical holes, 60 to 80 are set off in one blast. If vertical holes are combined with horizontal, 25 horizontal and 25 vertical are set off together, or about the same number as previously set off in a blast with conventional explosives. Nine- and 17-milli-second delays are used with Primacord to detonate the charges.

ADDITIONAL BENEFITS: Lower stripping cost through better fragmentation and lower cost per lb of explosive.

25% INCREASE in stripping rate and lower costs in breaking overburden have resulted from use of Akremite at DeBardeleben Coal Corp.'s Empire No. 6 in Alabama.

Case History No. 3

MINE: Colonial, Colonial Coal Co., Madisonville, Ky.

SHOOTING RESULTS: Akremite combined with new rotary dry-type vertical drill increased stripping output by 90 cu yd per hr. Because of unusually difficult conditions encountered in a faulted area since Akremite has been used, it has been difficult to measure benefits accurately, but management feels that using Akremite pound for pound in place of conventional ammonia explosives, a 40 to 60% savings in cost of explosives is achieved. Explosives ratio is 1 lb to 3¼ cu yd of overburden.

OVERBURDEN: Hard abrasive sandstone, sandy shale and limestone, with the sandstone predominating. Average thickness removed is 50 ft.

DRILLING: Vertical 50-R rotary dry-type drill holes 10⅝-in. holes on maximum of 35-ft centers. Hole spacing depends on thickness of overburden. Three-man crew handles drilling and shooting, averaging 125 ft per hr, including drilling, moving, loading and wiring. Average shift is 875 ft of drilling and placement of 13,600 lb of Akremite. Drill kept well ahead of two stripping units and was not operated for a 2-mo period while stripping caught up. Holes are drilled only to limestone cap rock over No. 12 coal.

CHARGING PLAN: Charging chart is placed in the small powder wagon to guide blasters in loading. Proper charges to yield 3¼ cu yd of overburden per pound of Akremite are listed for various hole spacings. In all cases 18 to 20 ft of stemming is used. Holes are loaded fully with Akremite to within 18 to 20 ft of top and one or two primers are used, depending on depth. If less than 400 lb of explosives are used per hole, only one primer is needed. A 50-ft buffer of broken rock is maintained between pit and shot.

Akremite consumption from May through December 1954 totals 724,000 lb.

Case History No. 4

MINE: Robbins, Robbins Coal Co., Oneonta, Blount County, Ala.

SHOOTING RESULTS: Removal of 20 to 30% of the overburden to the spoil area by Akremite alone, made possible by low cost of new explosive. Excellent fragmentation, permitting strip units to operate more efficiently. Hole spacing increased from 24x24-ft to 25x27-ft rectangles. With up to 2 ft of water in holes, have experienced no trouble, but wet holes are always shot within 8 hr after loading. Highwall sheared smoothly and more nearly vertical than when shot with conventional explosives. Less kickback or shattering of the highwall. Average consumption of Akremite is 1 lb per 2.67 cu yd of material removed.

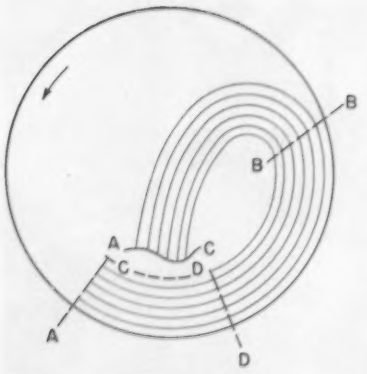
OVERBURDEN: Hard sandstones and shales, ranging up to 90 ft thick.

DRILLING: Blastholes, 9-in. in diameter, drilled vertically on 27 ft centers. Three rows on 25-ft centers are shot in 75-ft-wide pit. Two men use a company-designed dry-type rotary unit for drilling on a two-shift basis.

CHARGING PLAN: Blastholes drilled through tough sandstone and shales to top of 10-ft layer of soft shale over coal. Akremite concentrated in sandstone. Front row of holes charged extra heavily (1 lb per 2 cu yd of material) so 20 to 30% of material will be thrown clear of pit and need not be handled by shovel. Deck loading used where shale separates sandstone. Second and third rows are charged with 1 lb per 3 cu yd. No more than 40 holes are fired at once, and 25-millisecond delays are used between holes.

MANPOWER: Two-man drilling crews handle all loading and blasting except for some help from an extra man, who spends about half a day with each crew 2 or 3 days per week.

ADDITIONAL BENEFITS: Easier loading than conventional explosives. No headache in handling. Danger of breaking Primacord less than with other explosives.



BALL PATHS in a cataracting tumbling mill.

Table I—Improvements in Mill Performance at Copperhill Due to Decreased Ball Load

	Now	Before
Ball load, tons	35	55
Ball load, % volume	29%	45%
Tonnage	2250	2130
Horsepower requirements	370	490
Ball consumption, lb/ton	0.84	1.02
Grind: sulphides—200 mesh	65%	62%
Grind: gangue—200 mesh	35%	40%
Tails: copper	0.068%	0.08%
Tails: sulphur	2.5%	4.0%
Sod. ethyl xanthate, lb/ton	.28	.34

Copperhill Ball Mill—A Mathematical Explanation

JOHN P. ZANNARAS
United States Tungsten Corp.
Congress, Ariz.

GRINDING IN A BALL MILL is done by a variety of forces such as compression, impact, sliding and rolling friction, etc. Such forces are exerted between the balls and the shell, between the balls themselves, between the balls and the ore particles, and between the ore particles themselves.

Intensity and proportion of each of the above forces vary according to the operational conditions of the mill such as speed, size and amount of the ball load, diameter of the mill, hardness and size of the ore, etc.

If we call these variables by the letters x, y, z, u, v, then the total input energy in the mill to overcome the above resistances will be a function of the above mentioned variables. Also the capacity and efficiency of the mill will be a function of the same variables or expressing it mathematically,

Energy Input $= f(x, y, z, u, v)$
Capacity $= \phi(x, y, z, u, v)$
Efficiency $= \psi(x, y, z, u, v)$

If we could obtain a solution of the above functions we could manipulate the different variables to obtain the results desired, such as maximum efficiency. Up to the present time, however, a complete solution of the above functions has not been accomplished.

Up to now it was thought that the larger the ball load the greater the capacity of the mill, yet the Copperhill mill experience shows that by a decrease of the ball load they obtained an increase both in the capacity and efficiency of the mill.

It is the opinion of men conversant with the theory and operation of mills that lowering the ball load and maintaining the same speed will intensify the cascading action of the mill (Bunting S. Crocker, *E&MJ*, June 1953); that the ball cycles per revolution will be increased tending to more action by the balls (Harlow Hardinge, *E&MJ*, June 1953); and that higher ratio of ore to the ball load will contribute to more grinding and less waste of energy (Prof. Fahrenwald).

All the above statements are correct yet why were the contrary beliefs held by the industry up to the time of the Copperhill mill experiment? It may be because the above reasons, although correct, are only contributory causes and not the deciding factor.

It is the opinion of this writer that the Copperhill operation has hit on some optimum condition of combined causes or variables which I will attempt to explain mathematically.

In *Taggart's Handbook of Mineral Dressing* page 5-06 we find, "The photographs of Gow et al. indicate, however, that in cascading the branch bb —cc of the ball path in Fig. 2 simply collapses onto the upcoming layer, also that the toe persists in cascading action." (See illustration above.)

The above statement clearly shows the existence of the toe in cascading action and that the grinding is done by impact, and since most of the grinding takes place at the toe it seems reasonable to investigate the stresses imparted to the grains of the ore by the balls in this region.

The stress produced by impact by a moving weight is given in page 328 in a book of *Mechanics of Materials* by Mansfield Merriman, 11th Edit.

T = the unit stress in lbs per in. produced by the moving load
S = the unit stress by the static load
P = Static Load (weight of one ball)
ϵ = the unit of shortening
e = the shortening of the grain due to the static load P
h = the height in feet through which P has fallen
E = the Modulus of elasticity of the rock
L = the size of the grain (assumed to be a cube of side L)

$$T = S + S\left(I + \frac{2h}{e}\right)^{\frac{1}{2}}$$

The above formula can be slightly modified with practically no sacrifice of its accuracy to the following form:

$T = S(2h/e)^{\frac{1}{2}}$

The following relationship is known from mechanics:

$$S = \frac{P}{a} = \frac{P}{L^2} \qquad e = \epsilon L \qquad \epsilon = \frac{S}{E}$$

Substituting in the modified formula the values of S and e we have

$$T = (2hEP/L^3)^{\frac{1}{2}}$$

(Zannaras Equation)

We now have arrived at an interesting equation which points to the optimum conditions that must exist for the impact forces at the toe. According to my theory in order to obtain the maximum efficiency for grinding in a ball mill the variables indicated by this equation must be so adjusted as to give the impact stress T equal to the crushing strength of the rock as computed from the maximum size of the grain present in the feed.

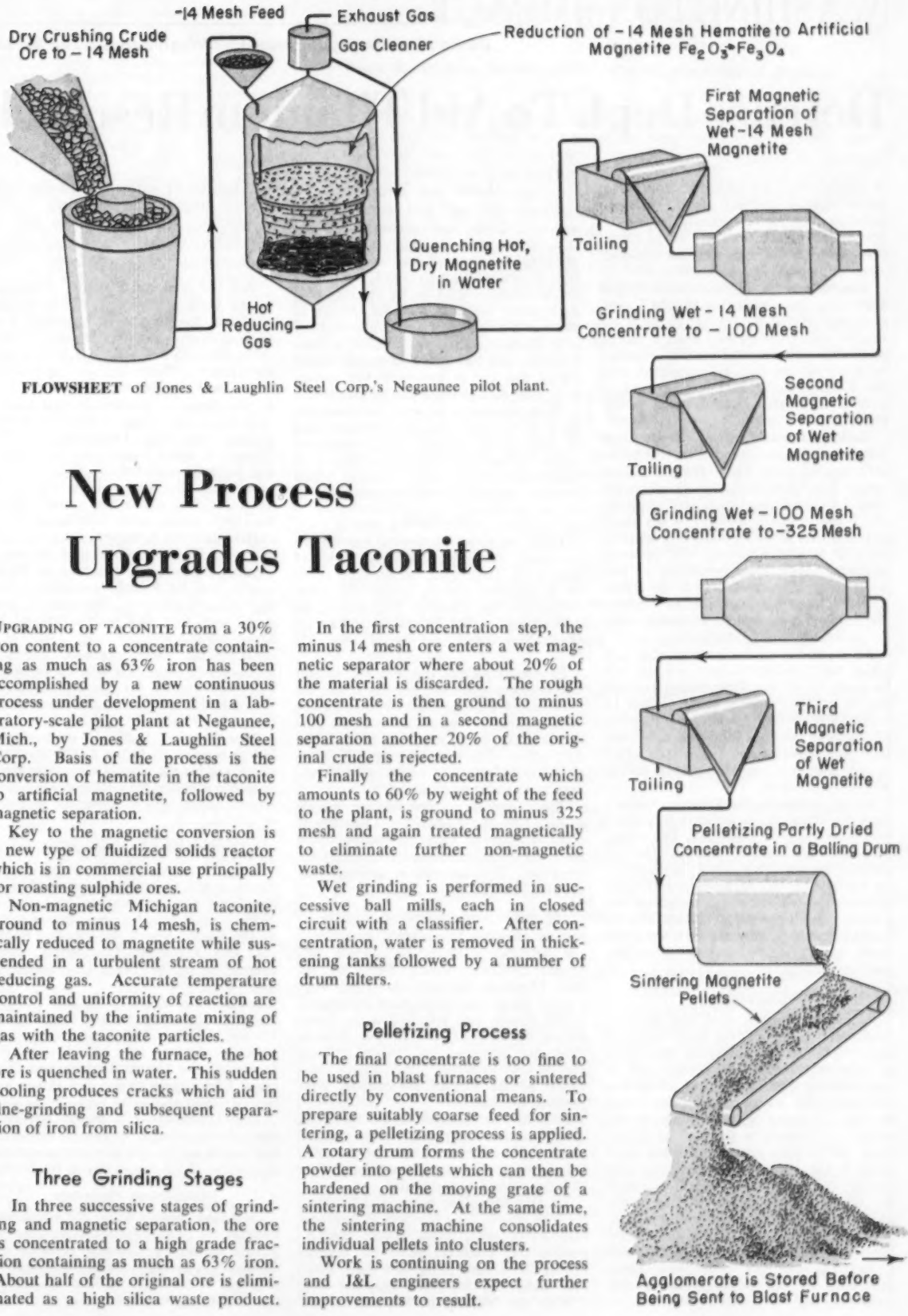
If T is greater than the compressive strength of the rock it will cause waste of energy and slimes. If T is smaller than the compressive strength of the rock it will fail to crush it as happens occasionally in some ball mills when a hard residue accumulates in the mill.

The above equation indicates that the stress T produced by the ball at the toe depends on the following variables:

E Modulus of elasticity and depends on the nature of the rock.
h Kinetic energy of the balls which can be adjusted by the speed of the mill, the amount of the ball load, the diameter of the mill, the dilution of the feed, etc.
P Size and the specific gravity of the ball.
L Maximum size of the feed.

The importance of this equation is that for the first time we can observe how these variables affect the grinding

(*Continued on p 115*)


-14 Mesh Feed
Exhaust Gas
Dry Crushing Crude Ore to – 14 Mesh
Gas Cleaner
Reduction of – 14 Mesh Hematite to Artificial Magnetite Fe_2O_3•Fe_3O_4
First Magnetic Separation of Wet – 14 Mesh Magnetite
Tailing
Quenching Hot, Dry Magnetite in Water
Hot Reducing Gas
Grinding Wet – 14 Mesh Concentrate to – 100 Mesh
Second Magnetic Separation of Wet Magnetite
Tailing
Grinding Wet – 100 Mesh Concentrate to – 325 Mesh
Third Magnetic Separation of Wet Magnetite
Tailing
Pelletizing Partly Dried Concentrate in a Balling Drum
Sintering Magnetite Pellets
Agglomerate is Stored Before Being Sent to Blast Furnace

FLOWSHEET of Jones & Laughlin Steel Corp.'s Negaunee pilot plant.

New Process Upgrades Taconite

UPGRADING OF TACONITE from a 30% iron content to a concentrate containing as much as 63% iron has been accomplished by a new continuous process under development in a laboratory-scale pilot plant at Negaunee, Mich., by Jones & Laughlin Steel Corp. Basis of the process is the conversion of hematite in the taconite to artificial magnetite, followed by magnetic separation.

Key to the magnetic conversion is a new type of fluidized solids reactor which is in commercial use principally for roasting sulphide ores.

Non-magnetic Michigan taconite, ground to minus 14 mesh, is chemically reduced to magnetite while suspended in a turbulent stream of hot reducing gas. Accurate temperature control and uniformity of reaction are maintained by the intimate mixing of gas with the taconite particles.

After leaving the furnace, the hot ore is quenched in water. This sudden cooling produces cracks which aid in fine-grinding and subsequent separation of iron from silica.

Three Grinding Stages

In three successive stages of grinding and magnetic separation, the ore is concentrated to a high grade fraction containing as much as 63% iron. About half of the original ore is eliminated as a high silica waste product.

In the first concentration step, the minus 14 mesh ore enters a wet magnetic separator where about 20% of the material is discarded. The rough concentrate is then ground to minus 100 mesh and in a second magnetic separation another 20% of the original crude is rejected.

Finally the concentrate which amounts to 60% by weight of the feed to the plant, is ground to minus 325 mesh and again treated magnetically to eliminate further non-magnetic waste.

Wet grinding is performed in successive ball mills, each in closed circuit with a classifier. After concentration, water is removed in thickening tanks followed by a number of drum filters.

Pelletizing Process

The final concentrate is too fine to be used in blast furnaces or sintered directly by conventional means. To prepare suitably coarse feed for sintering, a pelletizing process is applied. A rotary drum forms the concentrate powder into pellets which can then be hardened on the moving grate of a sintering machine. At the same time, the sintering machine consolidates individual pellets into clusters.

Work is continuing on the process and J&L engineers expect further improvements to result.

WASHINGTON IMPACT

Berke Musselman, McGraw-Hill Washington News Bureau

Defense Dept. To Aid Titanium Research

A DEFENSE DEPARTMENT program for expanded Federal aid to titanium research was enthusiastically backed by consumers and fabricators at an April Business and Defense Services Administration meeting in Washington.

Simultaneously, ODM director Arthur Flemming announced that Harold Vance, chairman of the Studebaker-Packard executive committee, would head a special committee to review the present situation. In doing so, he will be associated with the Kellogg Committee, set up a little over a year ago to act as titanium advisor.

Defense Department program, which will get under way gradually, will probably require more funds from Congress before it is completed. It is based on the need for Government-supported research, which the titanium industry is too small to undertake. Since Defense is practically the sole user of titanium, it is the most interested, aside from producers, in seeing progress in development of the metal. A general research contract for Defense Department was signed in March with the Battele Memorial Institute.

As expansion of the present plan gets under way, specific research projects will be financed by the Department through private groups. One of the first will be a $200,000 project devoted to the study of titanium melting. Rem-Cru Titanium, Inc., will probably get it. Later, a larger project on titanium alloy sheet rolling will be established.

Direct contracts by Defense Department for titanium, in addition to current purchases, will be expedited. The whole program may take a year to develop. Defense funds will be made available to set up laboratories to develop additional military uses of the metal, based on the price to which the metal should eventually drop after present research has overcome some of the serious difficulties peculiar to titanium.

Shortages

Aluminum, copper, steel, and nickel—mushrooming demand for these metals in early 1955 caused numerous headaches to consumers. However, production is now catching up with demand, which has stabilized after a hectic rise in the earlier months. Demand will continue to be strong, particularly in the case of aluminum. "A" defense allotments in the third quarter are down for aluminum and copper, but up for steel. Civilian needs for the first two will more than make up for this, while steel consumption, more heavily utilized by the automobile industry than ever before, may drop back a little as Detroit's production gears downward in the autumn. Nickel will remain strong.

Lead and Zinc

Rumors fly thick and fast about lead and zinc. Latest scare to producers was that ODM was planning to cancel its monthly "accelerated" lead and zinc buying program through GSA. Although ODM officials seem to be at odds with each other on the issue, no change in the monthly purchases is anticipated.

If the program were halted, the Government still has goals to reach, which would call for its return to the market at a later date to complete commitments.

Most dissension is over the improvement in the lead and zinc industry, and at what point to pull out Government props. Metal now being purchased is going into the long-range stockpile, which is above minimum requirements.

Stockpile

ODM director Flemming expects 62 minimum stockpile objectives to be at least 75% completed by June 3, 1956. In a prepared speech before the Joint Committee on Defense Production, he said stockpiles for 39 materials had already been completed as of Dec. 31, 1954.

Flemming pointed out that $4.1-billion in minimum stockpile materials was on hand out of a $6.5-billion objective. Only $800-million in long-range stockpile materials have been acquired toward the $3.1-billion objective, making the entire stockpile objective $9.6-billion with current level at $4.9-billion.

These figures do not include metals acquired by the Agriculture Department through barter of CCC foodstuffs, which have not been transferred into ODM inventories. This amount is estimated at about $23,000,000.

Multiple Use of Mining Claims

Five identical bills—5561, Rep. Dawson (R-Utah); 5563, Rep. Fjare (R-Mont.); 5572, Rep. Young (R-Nev.); 5577, Rep. Ellsworth (R-Ore.); and 5595, Rep. Cooley (D-N. C.)—have been introduced in the House, and referred to the Committee on Interior and Insular Affairs. They are proposed to change existing mining laws to permit simultaneous utilization of the surface for broader purposes in the future.

In addition, provisions in the bills would require all persons with surface claim rights adverse to those of the mining patent applicant to assert them, thus clearing up title uncertainties.

To alleviate other possible difficulties, the bills would deny location of common varieties of sand, stone, gravel, cinders, pumice, and pumicite under the general mining laws—providing for their location under the Materials Disposal Act.

With the blessing of the Agriculture and Interior Departments, and with other general support, the bills have a good chance of passage. Hearings will be scheduled.

Fluorspar

Aid for domestic fluorspar producers, in the form of import limits on foreign fluorspar, has become an important issue in Washington. Senators Dirksen (R-Ill.), Allot (R-Colo.), Murray (D-Mont.), and Goldwater (R-Ariz.) are sponsoring S1576, which would limit imports to 25% of the domestic market. Several similar bills have also been introduced in the House, where Rep. Dempsey (D-N. M.) charged "foreign imports are monopolizing domestic use of fluorspar."

Assistant Secretary of Interior Felix Wormser has stated he would oppose the 25% quota until completion of a current nationwide survey of the fluorspar industry. He had commented before a meeting of industry members in Washington that he thought conditions were beginning to improve, although he may supplement that view with additional information shortly.

ODM has asked domestic fluorspar producers to supply its long-range stockpile requirements for the remainder of the calendar year, but deliveries must be made by Aug. 30, 1955.

Sen. Douglas (D-Ill.) is sponsoring a bill to require all future ODM fluorspar purchases for the stockpile to come from domestic supplies. He anticipates the 25% import quota bills to either be defeated or tabled.

Tin Smelter Recommendation

Rep. Thompson (D-Tex.) has introduced a bill to maintain production at the Texas City tin Smelter to June 30, 1956. It is identical to one agreed upon by the Senate Armed Services and Banking and Currency Committees upon completion of the Texas City investigation.

Senate was required to act on the legislation by April 30, and Rep. Mutter (D-Tex.), using the Senate study and evidence obtained in a March executive session of the House Banking and Currency Committee, anticipated House action at about the same time.

The Thompson Bill would advocate sale of the smelter to private industry, but would prefer Government operation to closing if no buyer could be found.

Manganese Hearings

Increased appropriations for additional Federal aid or a 50% incentive plan to private industry to increase research on domestic manganese beneficiation probably will be the result of hearings before the Senate Subcommittee on Strategic

Minerals and Metals. (See page 73)

Evidence was presented by Norwood B. Melcher of USBM that Bureau funds for beneficiation research had actually declined in the past year, and were currently running $800,000 yearly. Oliver Ralston, chief metallurgist for the Bureau of Mines, stated that private industry needs as much effort as incentive.

The meeting, chairmanned by Senator James Murray lasted for three days, hearing Assistant Secretary Wormser, ODM director Flemming and other authorities. Purpose was to spur interest in the domestic manganese upgrading program, as well as to set the stage for possible increased requests for appropriations to enlarge the pilot plant projects, several of which are proving satisfactory. Current upgrading processes produce 200,000 tons annually of the ore—short of a sufficient domestic source in case of war. India is prime supplier of high-grade ore at present.

GSA Alumina Plant Sale

Recommendations by the House Special Subcommittee on Government Activities, chairmanned by Rep. Brooks (D-Tex.) on conditions of the GSA sale of a Government-built alumina clay processing plant at Laramie, Wyoming, to Ideal Cement Co. will be announced shortly.

Monolith Portland Midwest Co., originally scheduled to operate the plant after it was built in World War II, claimed that the final go-round on bids was "designed to prevent anyone from bidding."

M nolith and Ideal bid just under $545,000 and $1,050,000, respectively, the first time, but bids were turned down. At that time, Monolith said it would continue the alumina processing, although Ideal said it would not.

On second bids, Monolith bid $600,000 and Ideal held on. Monolith susbequently raised its bids to $1,110,000 and Ideal again raised it to $1,200,000. Here bidding was halted, and GSA gave the plant to Ideal.

As a result, Ideal will not produce cement at the new plant, which adjoins its present one, but will use the plant to produce a light-weight substance to replace sand in its cement. GSA has stipulated that Ideal cannot produce cement in the acquired plant. The alumina clay facilities will remain intact in case the Government wishes to re-use them anytime within 10 years. Generally, the alumina operation has been termed economically unfeasible at the Laramie plant. (See page 157)

Lithium

Export controls for lithium have been ordered for all points except Canada requiring individual applications. This is the result of recent discoveries by AEC that the silvery-white metal, may be used as a fuel at a future time for nuclear power.

Unlike uranium, it is non-radioactive, and would be used to produce nuclear fusion instead of fission. It is the isotope Li^6, not Li^7, that would be used, not as a substitute for uranium, but rather an addition to the reaction.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

MINE-MILL PLAYS "ANGEL": A Congressional probe discloses that the Mine-Mill and Smelter Workers union was financial backer for the book, "False Witness," written by ex-Red Harvey Matusow in which the author claims to have lied in previous testimony against suspected Communists. MMSW attorney Nathan Witt reveals the union strategy in putting up $1,000 for publication.

- Knowing that Matusow was prepared to deny his previous charges against Mine-Mill official Clinton Jencks, the union put up the money to win a new trial for Jencks. He had been convicted of filing a false non-Communist affidavit, mainly on the basis of Matusow's accusations which are now denied.
- Mine-Mill added more funds later, but the strategy failed. Instead of Jencks winning a new trial, Matusow was sentenced to three years in jail for contempt of court.

RED-LED UNIONS SUFFER LABOR DEFEAT: In the past five years, Communist-dominated unions have been stung more by attacks of rival right-wing unions than by Government action. National Labor Relations Board figures show that Mine-Mill and other left-wing unions have lost more bargaining elections than they've won to opposition unions. For all unions, the national average is seven out of ten victories in board-sponsored elections to determine union representation.

- But for Mine-Mill during this period, the average is four wins to six losses. By this democratic process the suspect unions have been whittled down in size, revealing that their members use the opportunity to break away when it comes up. As a contrast, the Government's attempt to cut down the powers of Communist unions has been a failure. The Taft-Hartley Act non-Communist oath has proven ineffective; there have been few convictions for false filing. But the anti-Communist unions are doing the job.

AFL-CIO PACT BARS LEFT-WING UNIONS: Merger agreement of the two federations, to be completed late this year, specifically blocks admission of labor organizations which have been previously expelled from either the AFL or CIO. A clause in the new joint constitution says any affiliated union that teams up with an expelled union is subject to immediate expulsion itself.

- This slams the door in the face of Mine-Mill and other CIO-expelled unions who attempt to affiliate with the new AFL-CIO team. These Communist-controlled unions have been making merger overtures to affiliates of the two federations in hopes of escaping planned Federal crackdown. MMSW currently seeks a haven in the CIO Auto Workers after a blunt turn-down from the CIO United Steelworkers Union. Instead of making peace, the steel union has started a new drive to take over bargaining rights at Mine-Mill strongholds in Anaconda, Butte and a half-dozen other locations.
- The Government assault on MMSW and the other top suspect unions is still in the planning stage. But Justice Department officials have promised Congress that it's on the way. They plan to use the new Communist-Control Act which authorizes the Government to seek dissolution of unions which are revealed to be Communist-infiltrated. That law also specifically states that any AFL and CIO affiliates shall be considered as anti-Communist; an "out" that the Red unions are seeking in their attempt to tie up with the affiliated unions. But the new AFL-CIO constitution means they'll be wide open for prosecution when Justice makes its move.

CONGRESS STRIKES AT MINE DISEASE: Montana Rep. Lee Metcalf is pushing a bill that would authorize Federal aid to states for payment of disability and death benefits for victims of such dust diseases as silicosis. Mine-Mill has joined those behind the measure in seeking help from Washington; its lobbyists are hard at work on Capitol Hill in an attempt to win support.

NEW BOOKS

R. I. 5006, Report of Research and Technologic Work on Explosives, Explosions and Flames, Fiscal Years 1951 and 1952. By Bernard Lewis. This report summarizes fundamental research and technical studies conducted in the Explosives and Physical Sciences Div., Region 8, USBM, for the two years July 1, 1950 to June 30, 1952. Pp 66, plus plates and figures.

R. I. 5012, Diamond Drilling on the Shanton Magnetite-Ilmenite Deposits, Albany County, Wyo. By H. J. Hild. The Shanton and other similar deposits in the Laramie Mountains were examined during 1942, 1943 and 1945. The deposit was diamond drilled from August to November 1948 to determine the subsurface extent of the deposits. Pp 13, plus figures, tables.

R. I. 5014, Lead-Zinc Deposits of the Dunkleberg District, Granite County, Mont. By C. C. Popoff. Pp 41, plus maps, figures, tables.

R. I. 5023, Concentration of Oxide Manganese Ores from Northeastern Nevada (Caviglia-Vietti, Berning and Reed-Parker Deposits). By G. M. Potter and R. R. Wells. USBM collected 2-ton samples of four ores from three properties and tested them for amenability to ore dressing methods of concentration. Pp 13, plus tables.

R. I. 5024, Beneficiation if Oxide Manganese and Manganese-Silver Ores from Southern Arizona. By R. Havens, S. J. Hussey, J. A. McAllister and K. C. Dean. Beneficiation studies were made on samples from seven claims to determine the amenability of the ores to concentration. Pp 30, plus tables.

R. I. 5039, Beneficiation of Ferberite-Scheelite Ore from Germania Consolidated Mines, Inc., Stevens County, Wash. By P. H. Floyd and W. A. Stickney. Pp 6, plus tables.

R. I. 5040, Anchorage Testing of Mine Roof Bolts, Part 1, Slotted-Type Bolts. By A. J. Barry, L. A. Panek and John A. McCormick. Presents an analysis of data obtained in a study of anchorage capacity of roof bolts, when anchored in sandstone and shale. Pp 11, plus plates, figures.

R. I. 5045, Determination of Solid and Liquid Impurities in Synthesis Gas. By L. J. Kane, H. W. Wainwright, C. C. Shale and A. E. Sands. Part of a Federal program to develop methods of producing gasoline, diesel fuel and other oil products from nonpetroleum sources. Pp 23, plus plates, figures.

R.I. 5067. Petroleum Sulfonate Flotation of Beryl. By S. M. Runke. Pp 19.

I. C. 7673, The Development of Permissible Requirements for Safe Underground Diesel Haulage. By M. A. Elliott and R. S. James. Pp 12, plus table.

Automotive defroster produced at the rate of 1500 an hour by the zinc die-casting process. This photo is one of a sequence portrayed in the American Zinc Institute die casting movie described below.

"Die Casting—How else would you make it?" is the challenging title of a new 16-mm color and sound motion picture which shows how to improve product design and cut production costs. Although the film has been prepared by the American Zinc Institute, the movie covers the broad field of die casting, showing the use of aluminum, magnesium, copper-base die-casting alloys as well as zinc. Members of the technical press who saw a preview of the film recently in New York, complimented the American Zinc Institute for its foresight in promoting the entire die casting industry not just that phase which deals only with zinc die casting alloys.

As a companion piece, the American Zinc Institute also published a 28-page, two-color booklet describing the die-casting process, explaining its advantages, and tabulating the essential properties of zinc, aluminum, magnesium, and copper die-casting alloys. This valuable little booklet may be obtained from the American Zinc Institute, Inc., 60 East 42 St., New York 17, N. Y. Bookings for the motion picture may also be arranged through the same organization. Time of the movie is 35 min.

I. C. 7674, Safe Storage, Handling and Use of Commercial Explosives in Metal Mines, Nonmetallic Mines and Quarries (Revision of I. C. 7380). By D. Harrington and J. E. East, Jr. Pp 28, plus tables and figures.

I. C. 7677, Recommendations on the Prevention and Suppression of Dust in Mining, Tunneling and Quarrying. Pp 16.

I. C. 7678, Roof Bolting in Alabama Coal Mines and Iron Ore Mines. By H. C. Young. Pp 15, plus plates, figures.

I.C. 7688. Black Hills Mineral Atlas. South Dakota Part 1 (of two parts). By Bureau of Mines Staff, Region V. Pp 123 plus illustrations.

The following reports may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at the prices specified:

U. S. Geological Survey Professional Paper 230, Geology of the Elkton Area, Virginia. By Philip B. King. A detailed report containing interesting problems of stratigraphy, structure, geomorphology and economic geology. Pp 82, plus maps, figures, tables. Price $1.75.

U. S. Geological Survey Professional Paper 235, Geology and Ore Deposits of the West Slope of the Mosquito Range. By Charles H. Behre, Jr. Includes the Leadville, Colo., mining district and was prepared in cooperation with the Colorado Geological Survey Board and the Colorado Metal Mining Fund. Pp 176, plus figures, plates and numerous maps. Price not specified.

U. S. Geological Survey Professional Paper 231, Physiography and Glacial Geology of Western Montana and Adjacent Areas. By W. C. Alden. A study of glacial features in the intermontane valleys and the drainage area of the upper Missouri and Columbia Rivers. Pp 200, plus plates, figures, maps. Price not specified.

Bulletin 986. Geology of the Jackson Area, Mississippi. Pp 133 plus maps. Price $1.75

Geological Survey Bulletin 995-B. Quicksilver Deposits of Steens Mountain and Pueblo Mountains, Southeast Oregon. By Howel Williams and Robert R. Compton. Pp. 76 plus maps, figures, index. Price 65c.

Geological Survey Bulletin 988-I. Prospecting for Uranium With Car-Mounted Equipment. By John M. Nelson. Pp. 11 plus graphs and figures, index. Also contains Geological Survey Bulletin 988, Contributions to the Geology of Uranium. Contains contents and index for chapters A to I, inclusive. Pp. 2. Price 15c.

Geological Survey Bulletin 989-C. Gypsiferous Deposits on Sheep Mountain, Alaska. By Richard A. Eckhart. A study of the six largest deposits of gypsiferous rock in the upper Matanuska Valley. Pp. 60 plus tables, plates, figures and index.

Bulletin 1005. Fluorspar Deposits of Utah. Pp 52 plus maps. Price not stipulated.

OPERATING IDEAS

For Efficient Pump Handling In Pits . . .

Handy Pumphouses

USING PORTABLE PUMP-AND-HOUSE UNITS and power shovels, Benson Mines cuts the details of pump moving at their iron ore pits in New York State. Each pump is housed in a sheet metal structure superimposed over an angle iron framework on skids. Lifting eyes and hooks are part of the design for lifting with a sling by power shovel or crane. An electric receptacle aids quick power hookups.

The staff of the Jones & Laughlin Steel Corp. operation at Star Lake, New York, planned the fabrication of the handy pumphouses for use with 6- and 8-in. Nagle "SW-OB" and 4-in. "QW" type pumps handling surface drainage. For discharge lines, large diameter heavy duty rubber hose and light weight Naylor pipe also facilitate the operation.

Another feature of some of the houses is a cantilever extension of an I-beam ridge pole and gable doors. This simplifies lifting and removal of the motor or pump for repairs. Screens around the base prevent damaging matter from entering the inlet.

For Recharging Repaired Batteries . . . . .

Handy Jumpers

TWO JUMPERS CUT A NEWLY REPAIRED CELL out of the circuit during operation (upper photo) and put it back in during charging (lower photo), thus permitting proper recharging. In maintenance of battery powered industrial equipment, field service engineers of Gould-National Batteries, Inc., have found that it is impossible to overemphasize the importance of recharging a repaired cell properly before putting it back in service. This frequently would mean having separate charging equipment or using the regular charger at the expense of another battery.

To eliminate such a situation, the two 18-in. jumpers made of No. 4 rubber-covered cable with automotive type clamp terminals soldered on each end, can be used as illustrated. The posts of the repaired cell and adjoining cells might have to be built up to fit the terminal clamps.

The procedure described should go on for at least two charging cycles to allow the repaired cell to gain the required charge. If four hourly readings of voltage and gravity remain constant the cell can be returned to normal duty. Of course, in all cases the specific gravity of the cell must be adjusted to proper value after recharging.

For Building Maintenance . . .

Bulb Changing . . .

NO LADDER IS NEEDED to replace bulbs if the corrugated cardboard wrapper the bulb comes in is crushed at one end to form a rough funnel and attached to the end of a broom handle or long pole with string.

Masonry Drilling . . .

A RUBBER DISK will keep plaster or other particles out of an electric drill chuck if placed on the bit and against the chuck. It also prevents the chuck from damaging the wall surface. Also shown at right is the use of a hole guide made from a piece of strap iron bent like a door handle and drilled to fit the drill. It insures accurate positioning.

For Your Safety News . . .

Picture of a Family Group

THE PICTURE SHOWN ABOVE is one of the proudest possessions of its owner, showing as it does his wife and family during one of their happiest occasions. Young John looks exactly like Dad did when he was that age, while Sandra and Joanne both reflect their mother's beauty and charm.

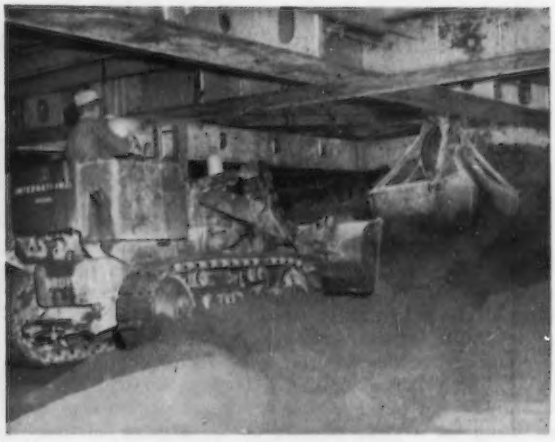
Actually, the picture is printed exactly as Dad sees it these days. Two years ago he was unfortunate enough to get some foreign matter in his eyes. **He neglected to get prompt first aid and medical attention,** with the result that he finally lost the sight of both eyes.

Everything looks like the picture you see above to Dad now. He has lost the sight of the only two eyes he will ever have.

Makes you think, doesn't it.

• *From the Hollinger Miner magazine, it shocked us plenty, too.—Ed.*

For Faster Ore Handling . . .



Try a Dozer and Clamshell

BY BUILDING A MOUND IN THE CENTER of a ship's hold, a 'dozer permits a clamshell to replace the old hand-filled bucket for ore unloading at Corpus Christi, Texas.

Applicable to use in other confined spaces—ore bins, sheds, etc.—this idea cut the labor force in half and quartered the time. The International TD-6 with Drott Skid Shovel attachment is lowered in and out of the hatch by a sling on a crane. While the sling is being replaced by a clamshell bucket, the tractor heaps a pile of ore directly under the open hatch. Once the clamshell starts loading, the 'dozer keeps a mound ready for full bites every time.

Nine men now do the same job as 18, four times faster using the clamshell and skid shovel. The combination set the Gulf port's generally accepted record—unloading 9,000 tons of mixed cargo of lead ore, zinc ore, bauxite and barite in 50 hours.

Rugged Work and a hose to match!

U. S. 4810 Air Hose

Jagged rocks, grinding gravel, severe cold and sun checking, punishing impacts from heavy equipment—all these were faced *and licked* by the "U. S." engineers who designed U. S. 4810. Reason enough why it's become one of the most popular of all hose for mines, quarries, shipyards and general construction work.

Combining super adhesion, great strength, high resistance to cuts and abrasion, and extreme *flexibility*, U. S. 4810 is recommended for all pneumatic tools and air drills, for use *wherever* high working pressures, abrasion, and general abuse pose problems.

Service-packed, economical U. S. 4810 Air Hose is available from any of our 27 District Sales Offices, or by writing to the address below. *Whatever* your hose requirements, you'll find it pays to turn to "U. S." There's a job-engineered U. S. Hose for practically every purpose — an expert staff of "U. S." Engineers to assist you with your hose selection.

- tough, flexible tube of neoprene provides top oil resistance
- high-tenacity, tire-type cable rayon braids give tremendous carcass strength
- thick cover of cut-resistant natural rubber wards off damage from rocks, tools, and equipment

"U.S." Research perfects it..."U.S." Production builds it... U.S. Industry depends on it.

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

PERSONALS

John D. Bradley New President of Bunker Hill

John D. Bradley (left) has been elected president, Bunker Hill & Sullivan Mining & Concentrating Co., succeeding **J. B. Haffner,** who has retired. Mr. Bradley is also executive vice president of Bradley Mining Co.

Ted Becker has resigned as chief mining engineer, American Zinc, Lead & Smelting Co., Grandview mine, Metaline Falls, Wash. to join Loma Uranium Corp., Denver, Colo., as geologist and mining engineer.

Kenneth M. Kuhns, plant manager, Kaiser Aluminum Corp. extrusion plant at Halethorpe, Md., has been named production superintendent at Kaiser's Trentwood rolling mill at Spokane, Wash.

George W. Tower, general manager of Mauricio Hochschild South American mining interests, who was in Chile in connection with a copper project under development there, returned to New York in April.

E. J. Fearing, retired general superintendent, Pickands Mather & Co., is now available for consulting services at Hibbing, Minn.

Charles R. Skinker, associated with the New Jersey Zinc Co. for the past 10 years, has been appointed secretary of Haile Mines, Inc. and its subsidiary companies, Tungsten Mining Corp. and Manganese, Inc.

Charles V. Harris, formerly with Nickel Processing Corp., Nicaro, Oriente, Cuba, has resigned to join the staff of the General Services Administration as Industrial Engineer assigned to the Nicaro expansion program.

William J. Shedwick Jr., consulting mining engineer in Mexico City, is now in Quito, Ecuador making geologic studies in connection with a hydraulic installation, financed by the Export-Import Bank and the International Bank for Reconstruction and Development in Washington.

John W. Svanholm has become associated with the Mineral Resources Development Corporation as consulting economic geologist for the Burmese Government in Rangoon, Burma.

Lucien Eaton Jr., design engineer, Utah Construction Co. on the New Jersey Zinc Co. project in Jefferson City, Tenn., has joined Kennecott Copper Corp.'s Western Mining division as design engineer.

J. G. McNiven, Yellowknife, N.W.T., has been named mine manager of Port Radium operations, Eldorado Mining & Refining, Ltd., succeeding **H. E. Lake** who has received another appointment with the company.

David E. Burns, mine manager, Canam Copper Co., Ltd., has joined the Bruhi Mining Co. at Silver Peak, Nev.

M. E. Volin, chief of the north central region, U. S. Bureau of Mines, Minneapolis, Minn., has been transferred to Washington, D. C., as chief of the Base Metal Branch.

Ralph E. Magnuson, Jr., former administration assistant to **Hugh J. Leach,** manager Minnesota mines, Cleveland Cliffs Iron Co., Hibbing, has been transferred to Ishpeming, Mich., as administrative assistant to **S. W Sundeen,** manager of ore development.

John P. Harmon, mining methods research engineer, Bureau of Mines experiment station, Pittsburgh, Pa., has joined the Phoenix, Ariz. office staff to specialize in the control of dust in mines, mills and smelters.

James E. Peterson has been named division labor relations director, and **James A. Lee,** division industrial relations director, Ray division, Kennecott Copper.

O'Dell C. Madsen has been named assistant division comptroller, Utah Copper division, Kennecott Copper Corp. He joined the company in 1937.

Charles Van Alstine, formerly with North Butte Mining Co., Butte, Montana, has been assigned to the recently established U. S. Atomic Energy Commission office at Coeur d'Alene, Idaho.

G. Leon Christensen, former secretary to D. D. Moffat, retired vice president and general manager, Utah Copper division, Kennecott Copper Corp. has been named employee service officer of the division.

Richard J. Smith, geologist, left New Jersey Zinc Co. to join the exploration staff of American Smelting & Refining Co. in Knoxville, Tenn.

Paul B. Jessup has been named secretary of Kennecott Copper Corp., succeeding **Robert C. Sullivan** who has joined the legal department.

D. W. Tittman, metallurgical engineer, St. Joseph Lead Co., Bonne Terre, Mo., has joined the Erie Mining Co., Aurora, Minn.

C. A. O'Connell, mine superintendent, Mufulira Copper Mines, Ltd., Northern Rhodesia, has been promoted to assistant manager.

Donald H. James Jr. and **G. W. Sander Jr.,** has joined the Toronto office staff of Technical Mine Consultants, Ltd. as chief geologist and geophysicist, respectively.

Bruce C. Macdonald, chief geologist, Eldorado Mining & Refining, Ltd., Beaverlodge operation, has set up in private practice in Edmonton, and Uranium City, Sask.

M. T. Pero Jr., Granby Co., Copper Mountain, B. C. has become associated with Lorado Uranium Mines, Ltd., Uranium City, Sask.

James J. Purdie Jr., has been transferred from the American Metal Co. geology and exploration department to geological staff of Heath Steele Mines, Ltd., Newcastle, N. B., a subsidiary.

S. Siscoe Jr., with Mindamar Metals Corp., Ltd., Stirling, N. S., has joined the staff of Campbell Chibougamau Mines, Ltd., Chibougamau, Que.

B. D. Weaver, superintendent of research and development, Tin Processing Corp., Texas City, Texas, has joined the firm of Multi-Minerals, Ltd., Toronto.

S. A. Huffman has been named superintendent of mechanical maintenance, Reserve Mining Co., Silver Bay, Minn.

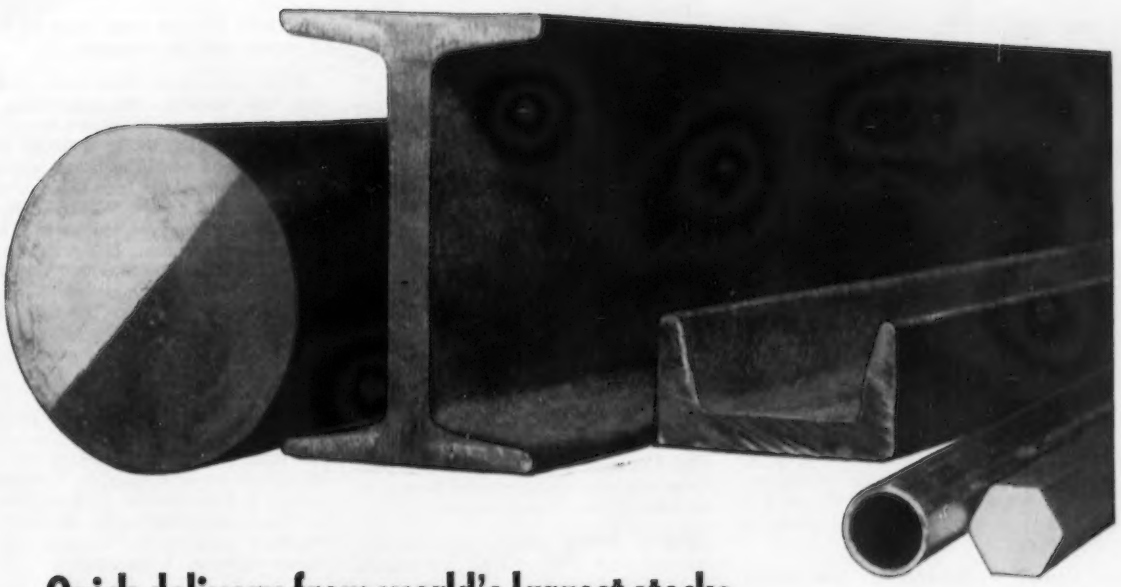
John C. Metcalf, assistant general manager, Pickands Mather & Co., Duluth, Minn., has retired February 1, after 35 yr of service with the company.

R. M. Mountjoy, superintendent of the concentrator for Copper Cities Mining Co., has been named to supervise the concentrator for the Miami Copper Co. in addition to his other duties.

J. M. Elias has been named exploration geologist in Grants, N. M., for Anaconda Copper Mining Co.

J. F. Wickham has been named mill

call Ryerson for steel carbon, alloy, stainless



Quick delivery from world's largest stocks

Whether you need a single piece or a truckload you can depend on prompt, personal service from your nearby Ryerson plant. So, for every kind of steel—when you need it—call Ryerson.

RYERSON CERTIFIED STEELS

RYERSON STEEL

Principal products in stock: bars, structurals, plates, sheets, tubing, alloy & stainless steel, reinforcing, etc., also machinery & tools

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

CEMENT CEMENT

PERSONALS *(Continued from p 108)*

William L. Walsh, manager of manufacturing, General Analine & Film Corp., has been appointed assistant to the president, Kennecott Copper Corp., with duties in the field of the company's titanium interests.

superintendent, Nuestra Señora unit of American Smelting & Refining Co., Mexico.

Larry F. Labow has been named managing director, Pardee Amalgamated Mines, Ltd., Toronto, Canada.

J. H. Vander Veer, lands and mineral staff officer, Region II, Bureau of Land Management, U. S. Dept. of the Interior, has resigned after 20 yr of Federal service to establish a consulting firm in Salt Lake City, Utah. He is succeeded by Walter H. Koch.

Frank R. Hunter has been named geologist, Industrial Minerals division, International Minerals & Chemical Corp., Chicago.

Charles R. Hubbard, mining engineer, U. S. Bureau of Mines, Region VI, Rolla, Mo., has resigned to become mining engineer, Idaho Bureau of Mines & Geology, University of Idaho, Moscow, Idaho.

Donald W. Schmidt has been named to the engineering dept., Chino Mines division, Kennecott Copper Corp., Santa Rita, N. M.

Frederick F. Franklin, assistant district manager, Cleveland office, Vanadium Corp. of America, has been named district manager.

Frank E. Thurston has been named mining superintendent, Beaver Mine, Asbestos Corp. Ltd., Black Lake, Que.

Christian F. Beukema, vice president, Michigan Limestone division, U. S. Steel Corp. since March 1954, has been named president succeeding **Hugh S. Lewis** who will continue in a consulting capacity.

Earl E. W. Kearly, mining engineer, Northern Peru Mining & Smelting Co., Trujillo, Peru, is now associated with Magna Copper Co., Superior, Ariz.

Alan Probert has resigned from the U. S. Bureau of Mines to accept a position as vice president and general manager of Cia. Minera de Guatemala, S. A. in Guatemala City.

John A. Smrekar has been named supervisor of industrial relations, taconite operations, Reserve Mining Co., Babbitt, Minn.

C. E. Amos, assistant general manager, ore mines & quarries, has been named administrative assistant to the vice president-production, Jones & Laughlin Steel Corp.

Arthur Linz, vice president, Climax Molybdenum Co. since 1942, has resigned to open offices as technical consultant in New York.

A. C. Munro, general superintendent, Britannia Mining & Smelting Co., Britannia Beach, B. C., has retired after 31 yr of service with the company.

Donald B. Banker has been transferred from Reynolds Mining Corp.'s fluorspar operation at Salida, Colo. to Alumina Research Dept., Reynolds Metals Co. at Listerhill, Ala. as chemist.

Samuel C. Fall, formerly with Anaconda Copper Mining Co. in Butte, Montana, has taken a position with American Smelting and Refining Co. in Tucson, Arizona.

R. P. Matson, safety engineer, M. A. Hanna Co.'s Iron River district, has been advanced to general operating engineer, and is succeeded by **Thomas C. Hecker.**

Thomas Boundy, well-known mining man in the Lake Superior area, has retired after 45 years with Republic Steel Corp. in Duluth.

W. S. Bauman has been transferred from Pickands, Mather & Co.'s Cuyuna Range engineering department to that of the Erie Mining Co. at Aurora.

Hal E. Brown, assistant chief mining engineer since 1953, Oliver Iron Mining division's Hibbing-Chisholm district, re-

A. E. Millar, general manager, Yerington Copper mining division, Anaconda Copper Mining Co., has been elected president of the Nevada Mining Association.

J. G. Huseby has resigned as assistant general manager, Mountain Copper Co. Ltd., to open a consulting office in Berkely, Calif. He was with Mountain Copper for 25 yr, most of that time as general superintendent of operations at Shasta.

tired Feb. 28 after more than 38 years of service with the company.

Jones & Laughlin Steel Corp., Minnesota Ore division, has announced the following personnel changes: **Clarence H. Sleeman,** assistant to the manager since 1953, has been made assistant manager; **Charles H. Grant** has been made division chief mining engineer; **William Ball,** superintendent, Longyear mine, has been named superintendent, Hill-Annex mine, succeeding **Ralph Brandon,** retired; **Julius Strande,** division engineer in charge of construction, succeeds Mr. Ball; and **Dan Madich,** in charge of maintenance, Westworth mine, is now general maintenance foreman.

Dr. C. W. Seibel, assistant director, USBM, will head the Bureau's re-organized helium activities. Assisting Dr. Seibel will be **Joe H. Cooley, P. V. Mullins, George E. Erlandson, E. M. Frost, Ernest G. Neu, George Shelton** and **W. M. Deaton. H. S. Kennedy** will maintain a small liaison office at Washington.

J. F. Wallace has been named associate professor, Metallurgical Engineering department, Case Institute of Technology, Cleveland.

Perry S. Gardner Jr., former superintendent at Silver Dollar Mine, Wallace, Idaho, has joined Frank Eichelberger & Associates, Spokane, Wash.

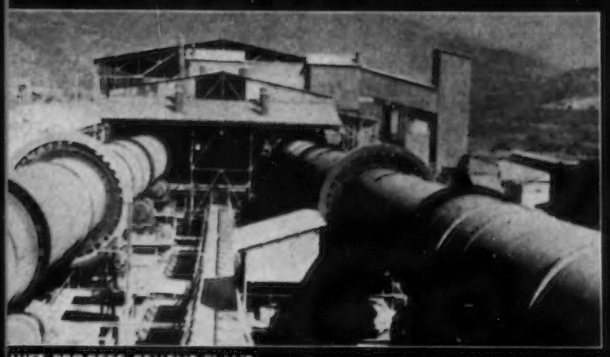
Wallace Fetzen, Duluth, geologist for Oglebay, Norton, has been transferred to the Cleveland office.

W. L. Edwards is now director of industrial relations for Reserve Mining Co.

Fred W. Denton, Oliver Iron, was named chairman of the Upper Peninsula Michigan section, AIME. **Richard Moe** is vice chairman and **Roy W. Drier** is secretary-treasurer.

Ira D. Odgers Jr. is president of the Iron County Engineers' Club; **Warren**

CEMENT



WET PROCESS CEMENT PLANT—
CEMENTO CERRO BLANCO: POLPAICO, CHILE

CEMENT

DRY PROCESS CEMENT PLANT: BIZERTE, TUNISIA

KENNEDY MACHINERY AND EQUIPMENT IS AN INVESTMENT IN EFFICIENCY

THESE INSTALLATIONS
HAVE PROVED THEIR WORTH . . .
SO HAVE MANY OTHERS
THROUGHOUT THE WORLD

LIME

LIME PLANT— CAL DE APASCO: APASCO, MEXICO

Whether you manufacture cement, lime, Dolomite, or produce Aggregates, Phosphate, etc., KVS machinery and equipment will enable you to produce peak tonnage at lowest operating and maintenance cost.

Experience gained in designing and building installations that operate under varied conditions enable our engineers to recommend the KVS equipment best suited to handle any required work.

The scope of our work is "anywhere in the World" . . . Our facilities for engineering and manufacturing are unsurpassed . . . Our record of achievement unmatched.

OUR SALES-ENGINEERING DEPARTMENT IS AT YOUR SERVICE FOR CONSULTATION AT ANY TIME.

IT COSTS LESS . . . TO OWN THE BEST!

KENNEDY PRODUCTS

- Gyratory Crushers
- Swing Jaw Crushers
- Tube Mills
- Ball & Rod Mills
- Vibrating Screens
- Rock Feeders
- Air Swept Tube Mills
- Rotary Kilns
- Coolers, Dryers
- Preheaters, Deheaters
- Belts, Conveyors
- Pneumatic Transport Systems
- Asbestos Plants
- Complete Lime Plants
- Complete Cement Plants
- Steam Generators
- Complete Aggregate Processing Plants
- Waste Heat Boilers
- Pulverized Coal Firing Systems

KENNEDY-VAN SAUN

MANUFACTURING & ENGINEERING CORPORATION

TWO PARK AVENUE • NEW YORK 16, N. Y. • FACTORY: DANVILLE, PA.

Here shown in actual use, Anaconda's new Securityflex Shuttle Car Cable withstands toughest mine conditions.

Anaconda introduces a

NEW SHUTTLE CAR CABLE

1 **New neoprene insulation compound** gives Securityflex cable physical toughness on the INSIDE as well as the outside.

2 **New stranding of grounding conductor** prevents broken wires — assures continuity of ground, fewer failures, fewer splices, less production loss.

3 **New nylon Anti-Short Breaker Strip*** helps give Securityflex amazing crush resistance. This construction minimizes short circuits between conductors even under heaviest impact.

New insulation, new stranding, new breaker strip, and jacket reinforcement mean longer, safer, more economical service than ever before from twin parallel cable.

"Heart trouble" causes most mine cable failure today. The jacket may look fine. But inside . . . in the heart of the cable . . . the story may be different. Insulation damaged — even punctured — or conductors broken.

Based on painstaking failure studies of all makes of cable, Anaconda has further improved its Securityflex* Shuttle Car Cable.

1 Rugged high-grade neoprene insulating compound greatly increases resistance to puncture, flame and crushing — a contributory cause of failure in mine cables.

2 Improved stranding of grounding and power conductors prevents broken wires—assures continuity of ground for the life of the cable.

3 Unlike other types of shuttle car cable, ANACONDA Securityflex with patented nylon breaker strip increases short circuit protection — more so than ever before. Nylon reinforcement in jacket also adds to cable strength and prevents wicking of moisture.

Actual mine tests show that this new construction greatly increases cable life because of fewer failures, therefore less down time. Improved Securityflex is another achievement of Anaconda mine cable engineers in the never-ending search for better, more reliable cable for mine use.

Ask the man from Anaconda for full information on new Securityflex Shuttle Car Cable. See your Anaconda distributor or write: Anaconda Wire & Cable, 25 Broadway, New York 4, N. Y.

*Trade Mark

ANACONDA®

MINE CABLE

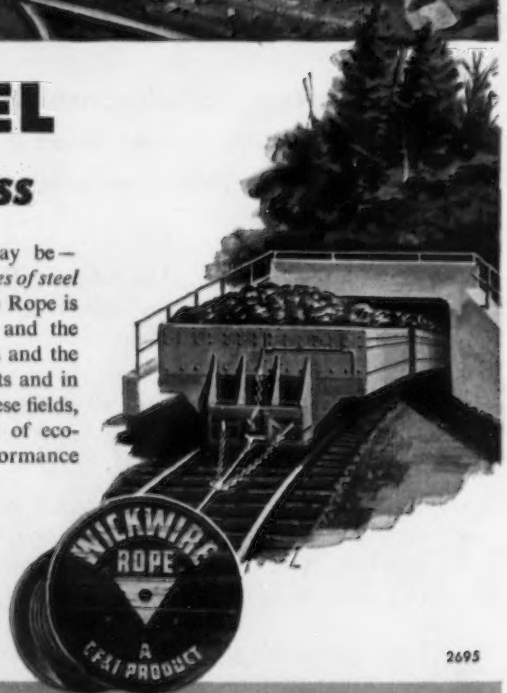
MUSCLES OF STEEL

put the mules out of business

Oldtimers in coal mining can remember when mule-power was the only means of transportation in the mines.

Today's efficient coal mining demands big-capacity mechanized equipment. In modern underground mines, wire rope serves as *muscles of steel*—pulling cars from the loader to discharge point. In strip mining, also, wire rope provides the *muscle* for huge stripping shovels.

No matter what the job may be—wherever there's need for *muscles of steel*—it's a safe bet that Wickwire Rope is busy at work. In the mines and the quarries. In the logging camps and the oil fields. With the fishing fleets and in materials handling. In all of these fields, Wickwire Rope has a record of economical and dependable performance that can't be beat.



***every* industry benefits from wire rope**

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2695

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans • New York • Philadelphia

PERSONALS (*Continued from p 110*)

Jamar is vice president; **Richard Brewer** is secretary; and **John Torreano,** treasurer.

Stanley M. Mercier, chief engineer, conveyor division for the past 15 yr, has been named manager of the western territory sales headquarters, San Francisco, Calif., recently opened by Jeffrey Mfg. Co.

Gunnar Bodvarssom, chief engineer, State Electricity Authority of Iceland, left recently for Mexico to study the possible commercial exploitation of three specific thermal areas. He is with the United Nations Technical Assistance Administration.

Jack White is returning to Northern Nigeria, B. W. A., where he will take up the appointment of general manager, Jantar Nigeria Co., Ltd.

J. J. Bean, plant engineer, Chemical Construction Corp. at Calera Cobalt Refinery, Garfield, Utah, has been transferred to the company's general offices in New York where he will engage in sales and engineering.

Manning W. Cox, chief geologist, Northwestern Mining Dept., American Smelting & Refining Co., has resigned to carry on a consulting practice.

Frank M. Rothrock, associated with the Day mining interests in the Coeur d'Alenes since 1899, retired in January as vice president of Day Mines, Inc. He is succeeded by **Wray Farmin,** president of the insurance firm of Farmin, Rothrock & Parrott, Inc., Spokane.

John F. Dugan, general superintendent of mines, International Smelting & Refining Co., retired Jan. 1, after nearly 50 yr of service with Anaconda Copper Mining Co. He will continue as consultant.

H. J. Vander Veer, mines and minerals staff officer, Region II, Bureau of Land Management, U. S. Dept. of Interior, resigned Jan. 15 to establish the consultant firm of H. J. Vander Veer & Associates.

H. Byron Mock, director of Region II, Bureau of Land Management, U. S. Dept. of Interior, resigned to enter practice of law emphasizing public lands practice.

M. A. Kuryla, director of safety and employee services, western operations, U. S. Smelting, Refining & Mining Co., has been named assistant manager of the Lima, Peru Div., Cerro de Pasco Corp.

H. E. Treichler, associated for 35 yr with Texas Gulf Sulphur Co., has joined the staff of Pan American Sulphur Co. as general consultant. At the time of his retirement from Texas Gulf in 1953, Mr. Treichler was vice president and general manager in charge of operations at Newgulf, Galveston, Moss Bluff and Spindletop, Texas.

Howe Sound Co. has announced the following changes in personnel at its Britannia Mining & Smelting organization: **T. M. Waterland** will assume the position of assistant manager, **L. L. Allan** will become mine superintendent, **A. T. Smith** and **P. W. Billwiller** have been made assistant mine superintendents. **William G. Hatch** has been named mill superintendent. **R. G. Blundell** has been made general mill foreman and **Peter S. Jack** has been named metallurgist. **J. MacIntyre** will assume the position of mechanical superintendent. **A. C. Munro,** general mill superintendent, has resigned after 32 yr of service with Britannia. **Gordon McMillan,** mine foreman for the past 13 yr, has been named general superintendent, Chief Consolidated Mining Co., Eureka, Utah.

Albert G. Wolf, vice president and manager of exploration, Texas Gulf Sulphur Co., has retired Jan. 1, 1955.

John H. White Jr., former president, Climax Uranium, has joined the staff of Standard Ore & Alloys Corp. to supervise its uranium expansion program.

Dr. Frank R. Hunter, with the company since 1945, has been named industrial minerals division geologist, International Minerals & Chemical Corp., Chicago.

David D. Baker has been named deputy director, mining division, Grand Junction Operations Office, U. S. Atomic Energy Commission, succeeding **John J. Curzon,** who recently resigned to enter private industry.

George M. Potter has been assigned by the Bureau of Mines to Mexico City for 2 yr as party chief and metallurgical engineer.

R. G. Smith, Folsom, Calif., has been re-elected president of the Natomas Co. Other officers elected at a stockholders meeting in Sacramento, include **Louis Sutter,** first vice president; **Clyde H. Brand,** second vice president, and **Wanda Durkee,** secretary-treasurer.

OBITUARIES

Harvey S. Mudd, 66, chairman of the board, Cyprus Mines Corp., died April 11 of a heart attack, in Los Angeles, Calif. A mining engineering graduate of Columbia University, Mr. Mudd became mining engineer with Shattuck Copper Mine, Bisbee, Ariz. In 1916 when his father, also a mining engineer, founded Cyprus Mines Corp. he joined that firm, succeeding his father as president and managing director in 1926. He was president of Pacific Alkali Co., director of Southern Pacific Co. and Texas Gulf Sulphur Co., and past president of AIME.

Paul H. Van Hoven, 68, retired president of the Duluth, Missabe & Iron Range Ry., died recently at Del Ray Beach, Florida.

Ivor J. Simcox, 63, assistant to the vice president, International Nickel Co. of Canada, Copper Cliff, Ont. until his retirement last year, died recently at La Jolla, Calif.

Norman C. Stines, 73, consulting engineer, U. S. Smelting, Refining & Mining Co., Winnemucca, Nev., died March 9 following a heart attack.

Harold W. Browall, 54, sales metallurgist, Inland Steel Co., Chicago, died March 9 while in Detroit on business.

Copperhill Explanation

(*Continued from page 100*)

in a ball mill. For example, it shows that when the grain sizes decrease by grinding, the stresses produced on them by the balls increase very rapidly, which explains the inefficiency and sliming effect of the ball mill as a grinding machine.

Other important conclusions can be reached by study of this formula:

(1) The smallest possible size of ball must be used.

(2) The highest specific gravity of material for the ball.

(3) The size of feed must be such that the stress T produced by the balls should be equal to the crushing strength of the rock. In other words, this equation indicates that for hard rock it will be preferable to make the feed finer and reduce the size of the balls than to feed coarse ore and use larger balls.

(4) That the speed of the mill, ball load, dilution of feed, must be so adjusted as to give to the balls the right amount of kinetic energy for producing T equal to the crushing strength of the rock.

It is on these variables that the Copperhill mill hit an optimum and according to the above formula the problem can now be approached in a scientific way and not by the rule of thumb or guesswork.

Here's Rope that takes the toughest service!

MONARCH WHYTE STRAND Wire Rope by MACWHYTE

This top quality Rope is available in all classifications—in the size and construction that will serve best on your equipment. MONARCH WHYTE STRAND is highest strength Wire Rope, made of Improved Plow Steel.

To meet the needs of all equipment and the toughest of service conditions, there are a thousand and one types, sizes, and grades of MONARCH WHYTE STRAND Rope. Each of the Wire Ropes in this selection is designed to fill an equipment need and to assure longer, safer service at lower operating cost.

These Ropes are available Internally Lubricated, PREformed, Lang Lay or Regular Lay, Fiber Core, or Independent Wire Rope Core. Wire combinations vary from 42 wires in 6 x 7 construction to 343 wires in 6 x 49 IWRC construction.

Put MONARCH WHYTE STRAND Wire Rope on your equipment. Enjoy the advantages of having the rope that will take the toughest service.

MACWHYTE

WIRE ROPE · SLINGS · WIRE ROPE ASSEMBLIES

Macwhyte Company • 2937 Fourteenth Avenue • Kenosha, Wisconsin

Manufacturers of: Internally Lubricated, PREformed Wire Rope; Braided Wire Rope Slings; Aircraft Cable and Assemblies; Nitinol Metal, Stainless Steel Wire Rope; and Wire Rope Assemblies.

MILL DEPOTS:
New York 4, 35 Water Street
Pittsburgh 19, 704 Empire Avenue
Chicago 6, 228 So. Desplaines Street
St. Paul 14, 2286 Hampden Avenue
Ft. Worth 1, P.O. Box 905
Portland 8, 1505 N.W. 14th Avenue
Seattle 4, 87 Holgate Street
San Francisco 7, 141 King Street
Los Angeles 21, 2035 Sacramento Street

1074

Ask for MONARCH WHYTE STRAND Bulletin 5425.

For the proper Wire Rope size and construction for your equipment, request a Macwhyte recommendation.

FINANCIAL AID TO HIGHER EDUCATION

Business Help for Our Colleges A Job for All Business Firms

IN recent months, individual business firms have announced the adoption of a variety of plans, both imposing and ingenious, for financial aid to higher education in the United States. In doing so, they have taken a lead in dealing with a problem of transcendent importance both to the business community and to our nation as a whole.

Previous editorials in this special series have shown that:

1. Our colleges and universities, and particularly the independent, privately endowed institutions, are in grave financial difficulties.

2. These difficulties promise to become much more acute in the years immediately ahead unless extraordinary steps are taken to relieve them.

3. A financially crippled system of higher education is a major national menace.

If, however, the business community is to play an adequate part in helping our colleges and universities financially, the plans adopted by business firms thus far constitute merely a beginning and a set of guide posts. What is required is a general movement on the part of business firms to go to the financial aid of higher education. Such a movement would involve a myriad of individual company plans which, in the nature of the case, cannot be expected to bring great renown or publicity to their sponsors.

Rescue Operation Is Feasible

For the business community as a whole it is feasible to make a major and possibly a decisive contribution to putting our colleges and universities back on their feet financially. One percent of business profits before taxes would do it. In 1954 business profits before taxes were about $35 billion. If one percent of these profits, or $350 million, were contributed to our independent, privately endowed colleges and universities it would enable these institutions (1) to increase the salaries they pay by $200 million a year, and (2) to provide $150 million more for modernization and maintenance of their establishments. In the opinion of competent authorities, this would put these institutions in relatively good working order financially, a process to which a matching grant of $50 million by the Ford Foundation for the improvement of faculty salaries will make a large contribution. It would add about one-fourth to their present annual outlay of about $1.4 billion.

Such a contribution from business would not meet the needs of the independent institutions for new buildings and equipment required to accommodate the great increase in college enrollment anticipated in the years immediately ahead. Neither would it relieve the financial problems of our tax-supported colleges and universities. As a group these institutions have fared better financially in recent years than the

independent institutions. But they also face grave financial problems, particularly in the provision of adequate faculty salaries. It would be far simpler, however, to solve the financial problems of the tax-supported institutions if the independent colleges and universities were back on their feet financially.

One Dollar Does Work of Two

The federal government exempts 5 percent of business profits from the tax imposed upon them if the 5 percent is devoted to religious, charitable or educational purposes. (Most profits are taxed 52 percent.) A contribution of one percent of business profits to higher educational institutions would exhaust only one-fifth of this allowance. It would bring to about two percent the total share of business profits going to both educational and charitable purposes.

In 1953, business firms contributed about $400 million, or slightly more than one percent of profits before taxes to educational and charitable purposes of all kinds. Of this total about $75 million went to educational institutions, mostly colleges and universities.

For some companies it is feasible to contribute more than the average contributed by business generally. Indeed, some companies not only utilize their full 5 percent of tax-deductible funds for charitable and educational purposes but go beyond it. For other companies in financial difficulties no contribution at all is possible.

If, however, those business firms for which it is financially feasible contributed one percent of their profits before taxes to our colleges and universities, the problem of adequate support for the crucially important business of higher education would be far along the way to successful solution. **In 1954 a contribution of one percent of their profits before taxes, or about $350 million, would have reduced business profits after taxes by only about half that amount. This would have meant a reduction of about $175 million, out of a total of about $17.8 billion of profits after taxes.**

Attractive plans to channel financial aid from business to higher education have been abundantly demonstrated recently. These plans, for the most part the creation of large corporations, have included not only a broad array of scholarship grants, but such ingenious arrangements as that by which a company matches with its funds the gifts its employees make to the colleges of which they are alumni.

A full array of these plans, some of which were discussed in an earlier editorial in this series, has been prepared by The Council for Financial Aid to Education (6 East 45th Street, New York City 17) and is available for the asking. Also, colleges and universities have established in most states and regions cooperative associations to help business help them. The Commision on Colleges and Industry (912 Kahn Building, Indianapolis 4, Indiana) distributes a directory of these associations. And, of course, the colleges themselves are always eager to discuss their financial problems with business people and suggest constructive solutions.

Only Small Start Made

The plans for business aid to education which have recently attracted national attention constitute the conspicuous sort of leadership which it is the privilege and opportunity of our great corporations to provide. But the job is too large to be handled by a small number of business firms, no matter how bold or ingenious their programs.

To put our colleges and universities back on a firm footing financially the help of the great rank and file of business corporations is required. All of them, large and small, have a crucial stake in seeing that this job is done. The future of America will be decisively shaped by what happens in and to our college classrooms.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

TD-14A Skid-Shovel Leads Double Life

3-TON LOADS of iron ore are moved from stockpile to haul trucks each trip by TD-14A Skid-Shovel in approximately 70 seconds. The 66 drawbar horsepower TD-14A supplies power for deep shovel penetration into ore pile. Skid-Shovel then rolls back at ground level quickly to retain heaped load—which is moved at ground level in high gear—and places a nine-ton load into trucks every 3½ minutes.

INTERNATIONAL DROTT Skid-Shovel loads trucks, salvages ore, helps maintains 7,000-ton monthly output at reopened iron mine

After standing idle for 30 years, an old iron ore mine is being reopened at Emory Gap, Tennessee, by the Walt Mining Company with a big assist from a TD-14A INTERNATIONAL DROTT Skid-Shovel.

This 66-horsepower front-end loader actually leads a double life . . . loads 9 tons of loose iron ore into haul trucks in 3½ minutes . . . salvages ore that has become mixed with dirt on the strip. This second operation is accomplished by quickly changing the standard Skid-Shovel bucket to a Rock Fork which permits a sifting method of ore reclamation.

The four sizes of INTERNATIONAL DROTT Skid-Shovels are opening up broad new areas of profitable operations in the entire mining field. They load trucks faster and more economically than any other loader. Yet that is but one job on which these units pay big returns.

Use them for stripping, cleaning the seams, recovering scattered ore deposits . . . and scores of other jobs that need doing at lowest cost on your diggings.

First, test the versatility and great workpower in these loaders at absolutely no cost or obligation. Just call your INTERNATIONAL Industrial Power Distributor. He'll demonstrate any of the four models—TD-6, TD-9, TD-14A and TD-18A. You just look, compare and see if you can afford not to have one of these machines working for you.

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS
DROTT MANUFACTURING CORP., MILWAUKEE 8, WISCONSIN

INTERNATIONAL HARVESTER

INTERNATIONAL®
DROTT

 (Continued from p 73)

Miners Discuss AEC 'Merit' Policies

PRESENT "MERIT SYSTEM" policy of the Atomic Energy Commission in awarding leases on withdrawn lands for uranium exploitation failed to draw as much criticism as had been expected at a public hearing held in Grand Junction, March 29-30.

Most uranium operators who testified or submitted written statements expressed approval of the present system. Under this plan, lessees are selected by an AEC committee on the basis of mining experience and financial ability.

Present method generally was supported by witnesses for the Colorado Mining Assn., including Robert S. Palmer, executive vice president, and Vernon Pick, chairman of the CMA uranium committee.

Opposed to the present plan were spokesmen for the 800-member Uranium Ore Producers Association, including Lt. Gov. Stephen L. R. McNichols of Colorado, Norman E. Ebbly and John I. Schumacher, UOPA vice president. UOPA argued that leases should be awarded by lottery, and charged that the present system is secretive, breeds favoritism and squeezes out the small operator.

Competitive bidding on leases was urged by Marvin L. Kay, general manager and vice president of Climax Uranium Co. Under his proposal, no large cash payments would be required, but payments would be made on a "pay-as-you-mine" basis. This, he said, would protect the small but qualified operators who do not have large cash resources.

Pick said in a prepared statement he favored the present method of selecting lessees by an AEC committee. He added that he felt the importance of the lease program has been overstressed, since "production from AEC leases accounts for only 10% of total uranium ore production."

Leases involved are on public domain withdrawn and explored by the AEC. Where substantial orebodies are located, the area is leased out to private firms for exploitation with the Government reserving a royalty.

Clark C. Vogel of the AEC general counsel's office, Washington, D. C., conducted the hearings. He said there presently are 34 leases in effect and that 15 or 20 areas may be leased in the next several years.

Lt. Gov. McNichols criticized AEC policies and said "the consensus of the UOPA is that a lottery is the only fair method of granting leases." Norman Ebbly of UOPA charged AEC is holding "two plums and a club" over the heads of prospective lessees. The plums, he said, were possibility that the operator might get a fat AEC lease, or get Government drilling on a lease. The club he described as the threat that if the operator "gets out of line" he may have his ore directed to a less favorable buying station.

"Because of these factors," said Ebbly, "a great many operators are afraid to talk against the present lease policies."

S. K. Droubay, general manager of the United Park City Mines Co. of Salt Lake City, Utah, urged that leases be given to mining companies which have had to curtail operations in lead, zinc, gold and other fields because of adverse Government policies.

"Since it is Government policy to aid foreign countries and foreign industries," he said, "it would be a kind gesture if the United States would afford some of the floundering domestic companies a chance to continue in business."

Duncan E. Harrison of Durango, Colo., representing the Lackalucre Mining Co., suggested that companies with claims adjoining AEC leases be given opportunity to mine the lease. He explained he had property with ore, but that a 600-ft shaft would be required to work it. The orebody is not large enough to make the shaft profitable unless it could be used to mine an adjoining AEC lease, he said.

Information Releases

In a recent "clarification" of policy, the Commission informed ore producers of Government security regulations concerning production of ore and ore reserves. These points were emphasized:

"1. Mill production records are classified.

"2. Certain processing methods of extracting uranium from ore are classified.

"3. There are no restrictions on photographing stockpiles, uranium mills or other installations from areas open to the public.

"4. AEC has never applied security restrictions on private uranium exploration and mining activities. Mine operators may issue to stockholders or for publication complete information on ore reserves, grade of ore, or ore production.

"5. Official AEC figures on overall ore production and ore reserves will not be publicly released as long as such figures might be of value to any enemy."

Sheldon P. Wimpfen, manager of the AEC's Grand Junction operations office, said the "clarification" was made because of misunderstanding created by an AEC letter to 35 major ore producers last Dec. 27. The earlier letter had been protested by uranium stock companies.

Wimpfen's new letter said "it is not intended . . . to restrict the disclosure of information to your stockholders, potential stockholders and others having a legitimate business interest in your operations, or to a bona fide representative of a United States medium of communication, press, radio, etc."

Higher Taxes, Reduced Output Hamper Mexican Mining

AN ANALYSIS of Mexico's 1954 metal and mineral production indicates that high taxes and thinning orebodies are weakening this important segment of the Mexican economy.

Danger signals arise from reduced output in Mexico's most important metals at a time when major mining firms say that there is little incentive because of high taxes to search out and develop new orebodies. Reduced production, and thus reduced taxes paid to government, comes also at a time when Mexico is desperately trying to build up its dollar reserves.

Mining historically is one of the main props of the Mexican economy. In 1953 some 20% of the government's total receipts were realized from the mining industry. In 1954, this amounted to only 15%. This is important not only to the government and to the mining companies but also to the 70,000 persons directly engaged in mining and the estimated 360,000 persons whose livelihood depends upon mining.

According to a reliable source, 37% of the gross income from sales of metals and minerals is paid out in taxes. There are said to be 19 different taxes which can be applied to mining.

Official estimates place 1954 production value at U. S. $228-million. In 1953, production value amounted to U. S. $253-million. Metal and mineral exports amounted to about U. S. $195-million as compared with U. S. $205-million in 1953. Of total reported value of metals and minerals produced, some 86% was exported—about 65% to the United States.

The somber side of the mining outlook is reflected by the older mining companies both in the deposits which they have been working for years and in their lack of incentive to develop new properties. Bright spot in Mexico's mining outlook concerns a new group of companies which are producing Frasch-process sulphur on the Isthmus of Tehuantepec. Heretofore, Mexico has had to import sulphur—in 1954 nearly 1,200 tons. Two companies already operating, and a third slated to get underway in July, expect to produce at least 600,000 tons in 1955.

Excluding sulphur, Mexico's most im-

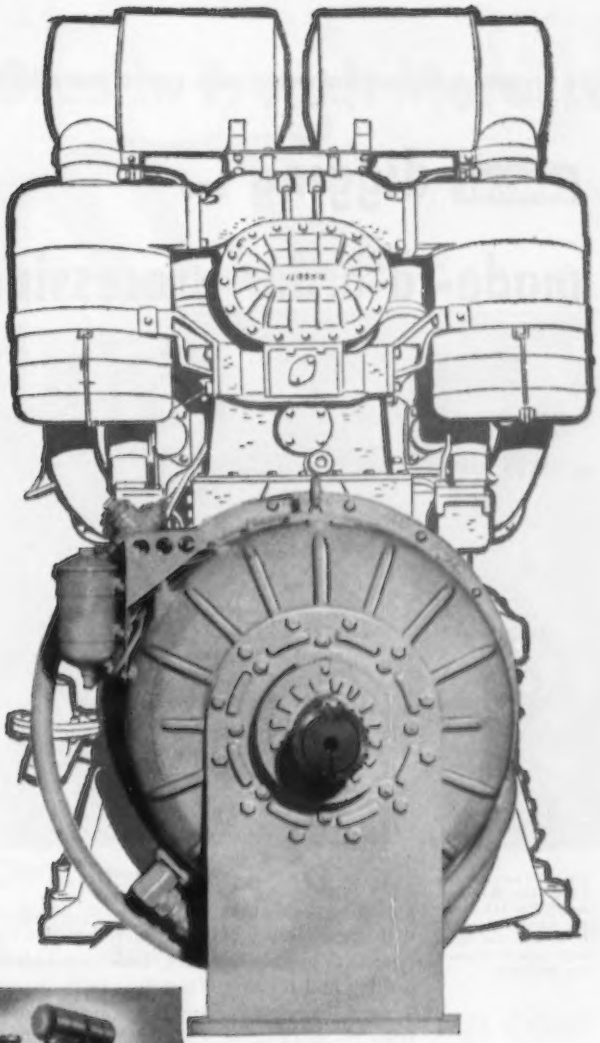
more flexibility
more wear life
more work

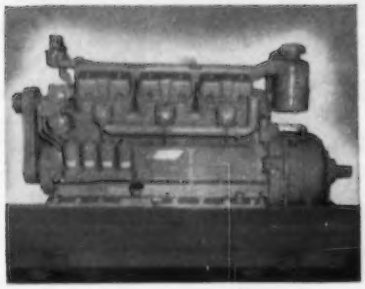
from new

CATERPILLAR

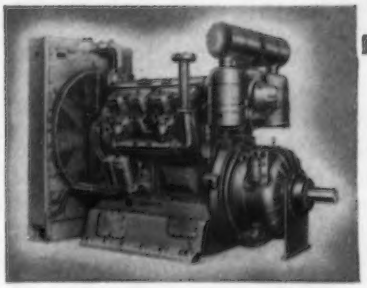
Torque Converter

Power Units . . .





Caterpillar Torque Converter Power Unit — a Model D386 Cat Diesel working through Twin Disc Model CF Torque Converter.



Cat D375 Torque Converter Power Unit. Twin Disc Torque Converters are standard equipment.

Twelve different torque converter arrangements are available for six Caterpillar Diesels, up to 493 hp. Twin Disc also provides a wide choice of output shafts, for both in-line and side loads.

FOR THE FIRST TIME, you can order any one of 6 Cat Diesel Engines *Torque Converter-equipped at the factory* . . . as complete Torque Converter Power Units, developed through design teamwork by Twin Disc and Caterpillar engineers.

The result is *tremendous* performance—for power source and power linkage are *ideally* matched.

To give you a quick idea of how much Torque Converters mean to modern diesel power, here are a few facts you'll want to remember: on the new Cat Power Units, the Twin Disc Torque Converters • *match torque output automatically to the load* • *start loads smoothly* • *provide control of load movement without using clutch* • *prevent overloads from killing engine* • *permit hovering or holding under power* • *keep engines operating in maximum efficiency range at all times.*

Whether you're thinking about a new power unit or planning to replace a present one, find out how much *more* flexibility, *more* wear life, and *more work* you'll get *through Twin Disc Torque Converter Drive.* Contact your engine dealer . . . he'll give you the facts and figures.

In the meantime, if you want more details on other Industrial-Type Torque Converters, write Twin Disc, Hydraulic Division, Rockford, Ill., and ask for Bulletin 135-D. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin; Hydraulic Division, Rockford, Illinois.

TWIN DISC

TWIN DISC

Torque Converters

To producers of sand and gravel, rare earths, and other mineral products

Combine digging and made-to-order processing plant aboard a YUBA dredge

This Yuba dredge (4000-ton displacement) digs 112 ft. below water with 18 cu. ft. buckets; has ample deck space for processing machinery.

Dredging costs under 5¢ per ton for gravel are not uncommon with large YUBA bucket ladder dredges. They also have dug cemented gravel, boulders, and into bedrock without costly drilling and blasting. They float in their own ponds, excavate without lowering surrounding water levels. Bucket sizes range from 2½ to 18 cu. ft. . . . digging depths from 10 ft. or less to 125 ft. below water.

Complete Plant Afloat

Your YUBA dredge can be built to screen out rocks; to break up and wash away surplus clay; to size through single or multiple screens; to remove mineral products by jigs, cones or magnetic separators. In short, you can completely process and grade your product as you dig, all aboard a YUBA dredge.

Choice of Handling Methods

Your dredge can be designed to stockpile ashore, load into trucks or shore conveyor; load into barges; or pump ashore through pipes.

Consult YUBA NOW. We can build you a new dredge . . . redesign, move and rebuild a used dredge . . . to fit your particular needs. Wire, write or call us — no obligation of course.

67

YUBA DREDGES — PROVED DEPENDABILITY

YUBA MANUFACTURING CO.

Room 706, 351 California St., San Francisco 4, California, U. S. A.

AGENTS { BIME, DARBY & CO., LTD. · SINGAPORE, KUALA LUMPUR, PENANG.
SHAW DARBY & CO., LTD., 14 & 19 LEADENHALL ST., LONDON, E. C. 3.

CABLES: YUBAMAN, SAN FRANCISCO · SHAWDARBCO, LONDON

Mexican Taxes *(Continued)*

portant income mining products are gold, silver, copper, lead and zinc. In 1954 these metals accounted for some 88% of the total official value of mining output and some 89% of the total official value of mining exports. Reduced production of all five of these metals was reported.

Gold: Production in 1954 amounted to 386,900 troy oz as compared with 483,472 in 1953. Of the 1954 total, 19.5% was exported, all to the U. S.

Silver: Production in 1954 was 40-million troy oz, continuing the decline from 47.1-million in 1953 and 50.4-million in 1952. In 1954, some 65% of silver exports went to the U. S., about 23% to Germany and the remainder to Latin American countries and other European nations.

Copper: Production in 1954 amounted to 54,800 tons, a decrease of 8.9% from that for 1953. Drop in copper output was traced largely to the closing in 1954 of the Boleo Copper Mine in Baja California. Copper exports in 1954 were 30,300 tons (38,200 in 1953), all of which was reported shipped to the U. S.

Lead and zinc: Despite threat of tariff increases in 1954, production of these metals varied little from the previous year. Output of lead in 1954 amounted to 216,600 tons, a decrease of 2.2% under 1953 production of 221,550 tons. Zinc production amounted to 223,750 tons, which was 1.2% under 1953 production of 226,540 tons. Total 1954 lead exports amounted to 208,950 tons, of which 72,500 tons were sent to the U. S. Exports of zinc totaled 207,900 tons; 178,199 tons to the U. S.

International M&CC Plans Mill, Buys Perlite Sites

INTERNATIONAL MINERALS & CHEMICAL CORP. will construct a $1.5-million nepheline syenite plant at Blue Mountain, Havelock, Ont., according to Louis M. Ware, president. Firm earlier announced purchase of U. S. Mining Co. and Peerless Perlite Co., both of California.

Both operations represent further steps in the corporation's diversification, said Norman J. Dunbeck, vice president of the industrial minerals division, who will supervise the California projects. Perlite properties have large reserves of high quality perlite in Inyo County, Calif., a plant at Big Pine and a perlite expanding plant at Los Angeles.

About 30-million tons of superior quality nepheline syenite, a high-alumina, high-alkali mineral, are controlled by International, and will be treated at the Ontario mill.

Two-Mile Belt at San Manuel

HEWITT-ROBINS, INC. has been awarded a contract to supply two miles of conveyor belting and machinery to San Manuel Copper Co.'s mine at Tiger, Ariz., which is expected to be the third largest copper mine in the U. S. when

Floating Lead-Zinc Ores in French Morocco

4,000-ton mill . . . low operating cost

SUCCESSFULLY treating Lead-Zinc Ores (both Sulphide and Oxide circuits) in far-away French Morocco typifies the world-wide service of Agitair in all fields of beneficiation. Agitair Flotation everywhere adapts to the most challenging requirements for dependable, low-cost mill operation. Each application is pre-tested by experienced Galigher engineers, who have every skill and pilot plant facility for developing the flow sheet.

Field exploration, ore testing, mill design and initial supervision are all a part of the famed Galigher service. Write today for the details. Request free literature on Agitair.

Other Galigher Products

Horizontal VACSEAL Pump
Vertical VACSEAL Pump
Laboratory AGITAIR
Acid-proof Sump Pumps
Laboratory Ball Mills
Geary-Jennings Sampler
Geary Reagent Feeder
Laboratory Pressure Filters

Leaders in Experience and Service

THE GALIGHER CO.

METALLURGICAL DIVISION · ENGINEERING SERVICE

CONSULTATION · ORE TESTING
PLANT DESIGN · GEOLOGIC INVESTIGATION

HOME OFFICE: P. O. Box 209 • Salt Lake City 10, Utah
EASTERN OFFICE: 921 Bergen Ave. (Room 721) • Jersey City 6, N.J.

The objective for this new potash plant was AS NEARLY AUTOMATIC OPERATION AS POSSIBLE, throughout every phase until the quality-controlled finished product is shipped.

3,000 tons of feed per 24 hours was the capacity sought, and every aspect of production and treatment was scaled to that figure.

Stearns-Roger engineered, designed, and constructed the plant—manufacturing special equipment in its Denver shops.

Early months of operation prove that owner and engineering contractor alike may stamp the project 'Mission Accomplished'

Another typical example of complete Stearns-Roger service to industry, with everything under one contract and responsibility undivided!

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

San Manuel *(Continued)*

production, planned for 1956, begins. Production at San Manuel was reported estimated at 70,000 tons per year when production starts.

Oliver Iron Closes Godfrey

R. T. ELSTAD, PRESIDENT OF OLIVER IRON MINING DIVISION, U. S. Steel, announced the scheduled closing of the firm's Godfrey mine, near Chisholm, Minn., on May 1. Elstad declared the mine was being closed because of "the high cost of the ore, of which taxes is a substantial item, and the decline in the quality of ore produced."

Godfrey had been in production since 1927 and has produced in excess of 11.5-million tons of ore. Elstad said the closing underlines "the need for an entirely different approach to mining problems in Minnesota."

Great Lakes Open

INLAND STEEL'S MOTOR SHIP, the E. J. Block, opened the iron ore shipping season on the Great Lakes April 7 by being the first vessel into Escanaba harbor on Green Bay, Wis. Captain Arthur Olson brought the Block alongside the Chicago and Northwestern Railway ore dock at 12:20 p. m.

IN THE U.S.

ALASKA

Two Juneau attorneys have incorporated Red Hawk Mines Alaska, Inc., to take over the reopening of the Riverside Mine under DMEA agreements. Operation was previously planned by Pacific Northern Minerals of Spokane.

Approximately $15,000 worth of diamond drill and electrical equipment has been landed at Funter Bay.

Four men have incorporated Red Top Mercury Mines to mine the prospect formerly referred to as the Wren-Waskey-Wolfe prospect. Property is on Marsh Mountain near Aleknagik, inland from Dillingham. Incorporators are Frank Waskey, Clarence Wren, Jim Putvin, and Charles Wolfe.

Work is going ahead at the DeCoursey-Brewis Red Devil mercury property. Mine has been unwatered, and the camp has been rehabilitated. Some difficulties are being experienced in complying with Coast Guard regulations concerning the company's river barge "Cinnabar."

ARIZONA

Scheduled closing of the Federal Government's manganese stockpiling depot at Wenden April 30 will shut down about 50 producing mines employing about 1,000 workers. Payroll represents about $5-million annually.

Mack Model LRSW hauling off overburden.

big shovels call for big trucks

Today's big-yardage jobs demand maximum loads per haul and faster time cycles from shovel to dumping point and return. Increasing use of larger and larger shovels points to the Mack Models LRSW and LRVSW six-wheel dump trucks as the answer to these stepped-up requirements.

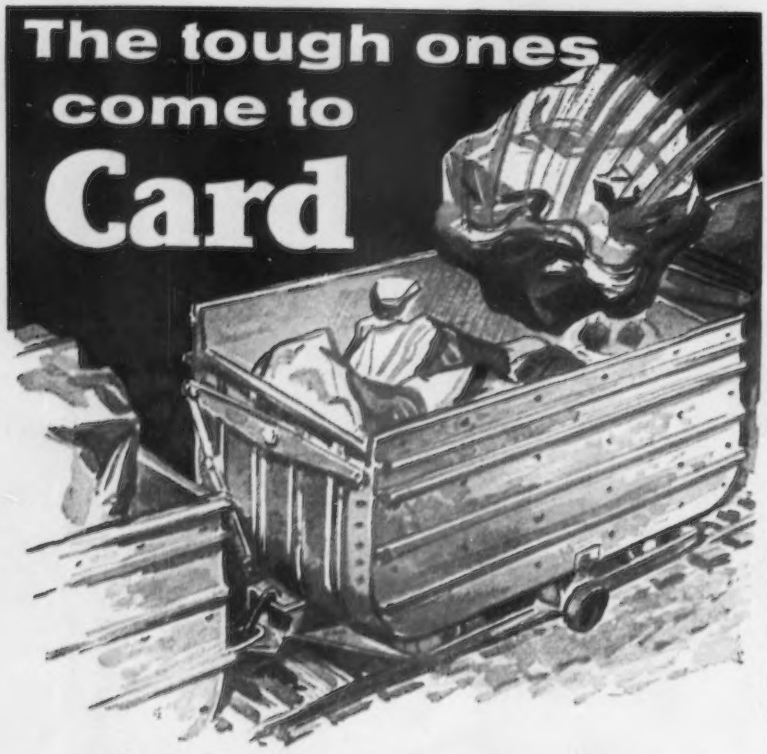
Here are trucks that are built to keep big shovels on the go...to give mine operators increased production per driver and per truck dollar invested.

These Macks will move 21 to 28 yards with unfaltering ease over the toughest terrain. No miring in with these Macks—they have the advantage of Mack's famous Balanced Bogie with exclusive Power-Divider, enabling them to pull through where other trucks bog down. In actual service these models have demonstrated their ability to maintain the time schedule of smaller-capacity dumpers.

Why not investigate the big-unit economy of Mack Models LRSW and LRVSW. It will pay you to see these big jobs at work.

MACK TRUCKS Empire State Building, New York 1, N. Y.

3030



In hard rock mining, haulage equipment takes a real beating. Three-ton boulders drop ten feet and more into mine cars with a force that dents good half-inch steel plate. CARD cars have whipped these tough conditions for many of the major ore producers of the western hemisphere.

Familiar names like these and many others dot the C. S. CARD customer lists over and over with their repeat orders. CARD cars built to order for these firms cost little more than standard stock models, yet they result in large savings because they are built to handle specific mining requirements.

●

CARD car engineering can do the same for you. Ask us for consultation on your outstanding haulage problem. No obligation.

CLIMAX MOLYBDENUM
INTERNATIONAL MINERALS
PHELPS DODGE
KENNECOTT COPPER
U. S. VANADIUM
U. S. POTASH
VERMONT COPPER
HOWE SOUND
CALERA MINING
HOMESTAKE
TELLURIDE MINES
IDARADO
CANANEA CONSOLIDATED COPPER CO.
ANACONDA
VICTOR CHEMICAL WORKS
CLEVELAND CLIFFS IRON
POTASH CO. OF AMERICA
CONSOLIDATED MINING & SMELTING CO. OF CANADA
AMERICAN SMELT. & REF.
UNITED STATES SMELT. REF. & MINING
UNION PACIFIC COAL
GENEVA COAL CO.
COLO. FUEL & IRON CORP.
INDEPENDENT COAL & COKE
COLO. & UTAH COAL
TUNGSTEN MINING
NEW JERSEY ZINC

C.S.Card Iron Works Co.
2501 WEST 16th AVE.,
DENVER, COLORADO

Arizona *(Continued)*

Wenden depot, in the heart of the nation's most extensive manganese deposits —Mohave, Yuma, Yavapai and Maricopa counties—was to reach maximum goal of 6,000,000 long tons of recoverable manganese about April 20.

Depot is the first of three in the West to reach its quota. Deming, N. M., has received about 2-million units and Butte, Mont. about 1-million. Both depots were in operation about a year prior to the Wenden depot.

Uranium strike in the Muggins Mountains, 8 miles north of Wellton in Yuma County, has been made by Walter L. Wooley and Fred McGraw. Eleven claims were filed with the main vein about 3,000 ft long and about 10 ft wide, reportedly showing a high percentage.

Don Lieberman Enterprises tungsten mill at Tucson is handling between 100-150 tpd, including scheelite, wolframite, and hubnerite. Milling is handled either through outright purchase of the ore or on a custom basis. Flowsheet calls for reduction to minus ¼-in. by a double set of crushing rolls.

Road building miners have drawn a warning from the state land department. They face cancellation of leases if they construct makeshift roads across public or private land without approval of the land department, or prior consultation with anyone.

Enoch Smith & Sons Construction Co. have uncovered mineralized areas over a 20-ft depth in initial open-pit stripping at the Spencer Uranium Co.'s Apache County properties.

Sid H. Eliason, Salt Lake City businessman, and chairman of Spencer, said the construction firm working on contract for the uranium company would ship ore in April to the Shiprock mill.

Prior to the contract with Enoch Smith, Spencer shipped 800 tons of ore to the mill. Area is believed to be an extension of Vanadium Corp. of America's Monument No. 2 mine. It is 4 miles south of the Utah border.

Utah Construction Co. as group operator, has commenced open cut mining and a projected diamond drilling program on claims in the Amado area.

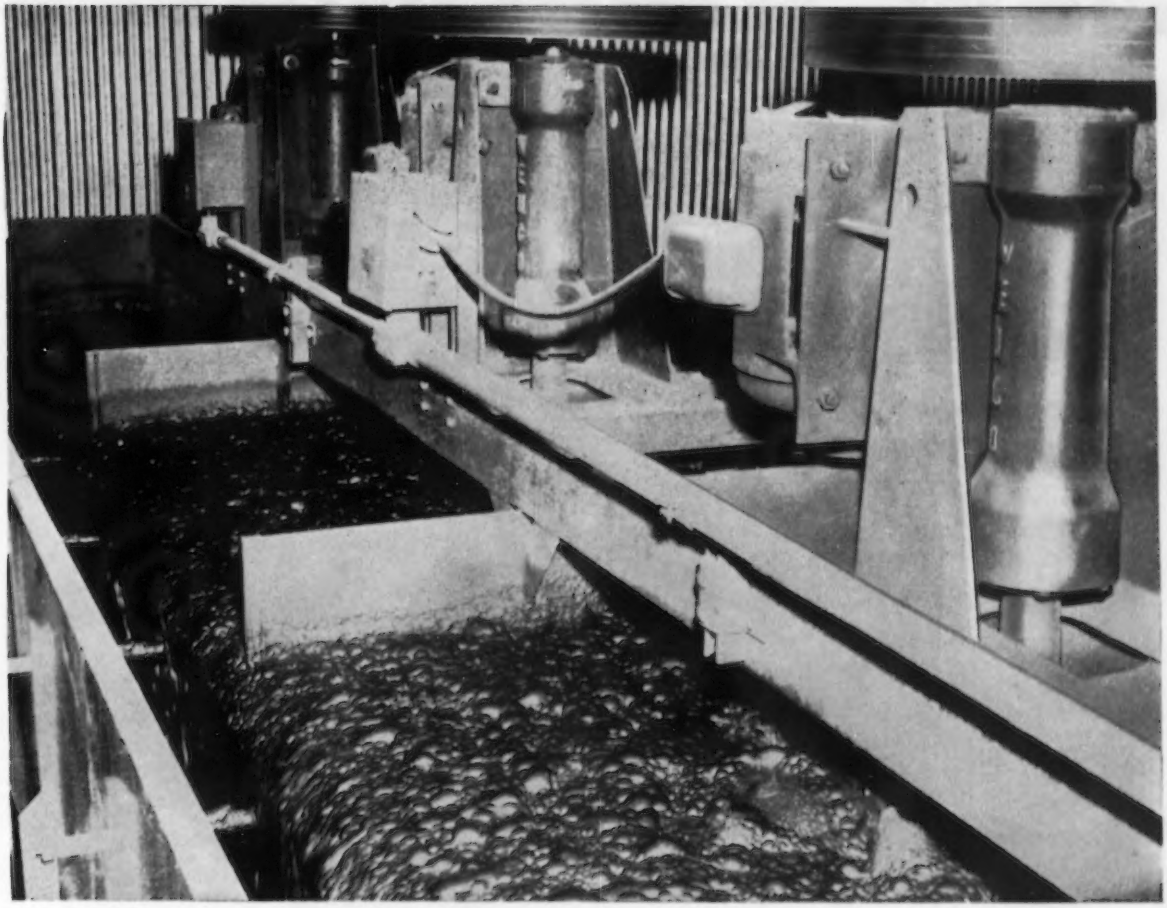
S. A. Walsh, president of Comstock Oil and Uranium, which shares interests with Santa Cruz Uranium and Utah in the venture, said open cut operations commenced Feb. 28 had already involved 20 claims with ore production stockpiled during process of exploration.

Walsh also said that Comstock would commence mining on 43 patented lode claims near Contact, Nev. for silver-gold-copper values by end of April.

CALIFORNIA

Posting of an AEC map in Bakersfield showing hot spots in the area touched off a new rush of some 1,500 prospectors to Kern County in March. However, most of the prospectors went home within a

DOW



RELIABLE DOW XANTHATES BRING INCREASED RECOVERY

Fast, complete separation of sulfide minerals at minimum cost can be yours through Dow Research

Increased recovery and improved concentrate grade show up immediately when you put Dow Xanthates to work in your mill. This has been proved in mills all over the world where these superior Dow collectors are improving metallurgy and saving dollars.

These Xanthates permit greater freedom in regulating frother and collector independently because they are reliable collectors, but substantially nonfrothing.

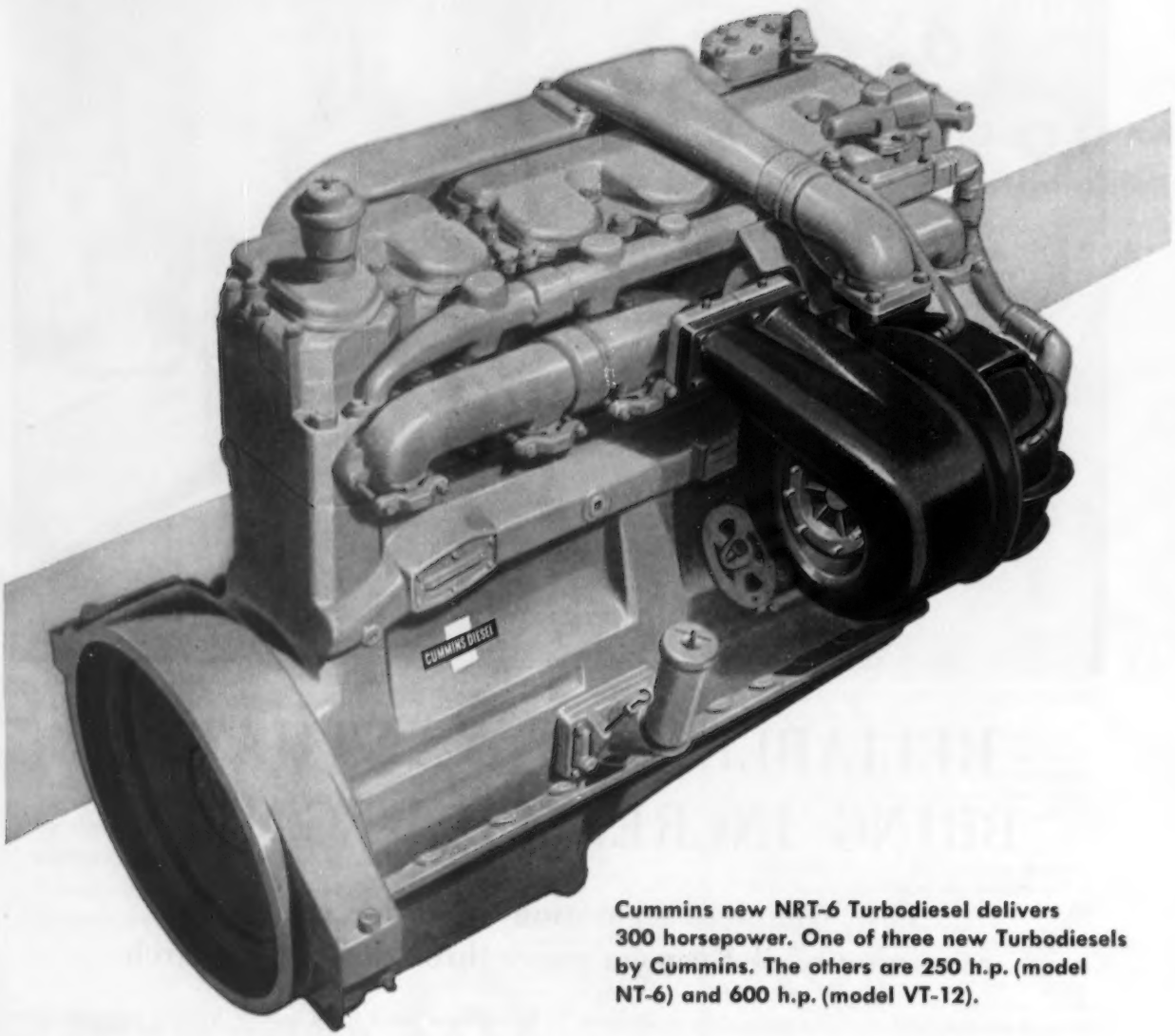
To fill your need for a quality frother, however, give Dowfroth® 250 a trial. It builds hard-working froth with reduced consumption.

Take advantage of Dow's many years of experience and research. To learn more about the quality flotation agents, Dow Xanthates and Dowfroth 250, write us for information and test samples. THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC 818H.

you can depend on DOW CHEMICALS

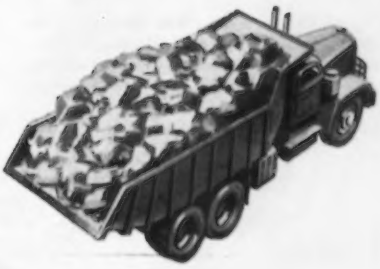
DOW

NEW TURBODIESEL



Cummins new NRT-6 Turbodiesel delivers 300 horsepower. One of three new Turbodiesels by Cummins. The others are 250 h.p. (model NT-6) and 600 h.p. (model VT-12).

BY CUMMINS



ups your production

and lowers your costs!

Cummins 300 h.p. turbocharged NRT-6 pulls full loads faster, permits higher speeds on grades, cuts cycle time, because it produces greater horsepower without increase in engine size or displacement.

Turbocharging—which harnesses exhaust gases normally wasted—produces this extra horsepower by achieving a more perfect air-fuel mixture in the combustion chamber. There is no parasitic load as in supercharged engines. This means drastically reduced fuel costs . . . fewer internal stresses . . . longer engine life.

In addition, Cummins exclusive PT fuel system is simple and trouble-free . . . makes fuel system maintenance costs negligible. It is so easy to understand and work with that no specialists are needed. And all Cummins Diesels run on inexpensive No. 2 diesel fuel or furnace oil.

For further information, see the Cummins distributor in your area, or send us this coupon today.

CUMMINS

Cummins Engine Company, Inc.
Columbus, Indiana

Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)

Cummins Engine Company, Inc.
Columbus, Indiana

Please send me detailed information on Cummins new NRT Turbodiesel.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

EM-5

California *(Continued)*

few days when it was discovered nearly all the property pinpointed had been staked out. Most likely uranium property, according to AEC, is in the area surrounding the Miracle Mine, which produced the state's largest uranium shipment.

Central Eureka Corp., San Jose, plans to enter the uranium field. Veteran gold-mining firm has optioned uranium claims in South Dakota and on the Colorado Plateau.

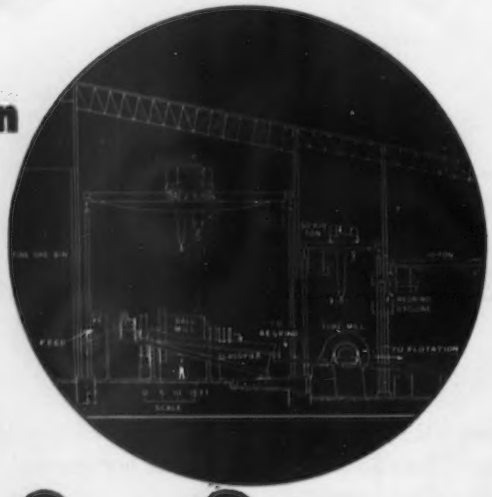
Donald Smith, chairman of the board, said the company also has exploration parties in the Moab, Utah, area and has applied to the AEC for a lease on additional uranium property.

A 14,260 lb shipment of uranium ore was sent to the AEC buying station at Marysvale, Utah, in March from property northeast of Mojave in the Castle Butte area.

New hot spot was found by Carl Ritter and Melvin Guthrie of Bakersfield.

Producing property, third in state to yield enough for a commercial shipment, is owned by a mining group which holds eight claims in the area covering several thousand feet.

lower concentration costs... with



CF&I grinding balls

Grinding costs, the most expensive item in the concentration process, can be cut when you use CF&I Grinding Balls. Forged of tough, special analysis steel, CF&I Grinding Balls have the ideal balance between toughness and hardness that means efficient, economical operation. You will get greater through-put, whether in coarse grinding or in the finer mesh sizes. CF&I Grinding Balls are available in diameters from ¾ inch to 5 inches.

CF&I Steel Products for the Mining Industry

Rock Bolts • Grinding Rods • Wickwire Rope • Mine Rails & Accessories

Cal-Wic Industrial Screens

CF&I FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

2517

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Casper • Chicago • Denver • Detroit
El Paso • Ft. Worth • Houston • Lincoln (Neb.) • Los Angeles • New Orleans • New York • Oakland • Oklahoma City
Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Wichita
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Montreal • Toronto • Vancouver • Winnipeg

Dr. Richard Atkinson said a 20-lb sample sent to the AEC office at Grand Junction assayed 0.43% U_3O_8. Atkinson said the ore foundation is rhyolite and the mineral probably torbenite.

Mountain Copper Co. has decided to convert its Iron Mountain pyrite mine, mined by underground methods since before the turn of the century, to an open pit operation.

Switch was made because the hard, dense ore, suitable for open stopes, was giving way to a crumbly, brecciated ore that could not be mined by low cost methods. Remaining ore in the underground operation was above the main haulage level, which posed a handling problem.

According to L. L. Kett, general manager, stripping equipment was to arrive on the mine site, near Redding in Shasta County, in mid-April, and preliminary stripping was to begin then on an around-the-clock basis. Underground mining will continue until ore is available in the oper. pit operation.

A new orebody, the one closest to the surface, was selected for open pit mining. Work force will be increased—to about 70—for the initial work, but the company expects the switch eventually will result in a smaller work force. Preliminary stripping is expected to require 5-6 months.

C. W. McClung, vice president in charge of operations, will be in charge.

COLORADO

Possibility that a special-type uranium mill may be built at Gunnison within the next year was indicated in an address made by Sheldon P. Wimpfen, manager of the AEC's Grand Junction operations office, before the Gunnison County Chamber of Commerce.

Wimpfen said a mill might be approved for Gunnison if ore production and discovery continues at the present rate for another six months.

It was explained that ore from the nearby Los Ochos property of the Thornburg brothers now must be shipped to Salt Lake City for processing. Los Ochos reserves alone are valued at more than $10-million, and Wimpfen said technicians now are trying to determine the most efficient method for treating that type of ore.

Work on the $2-million expansion to the Climax Uranium Co.'s mill at Grand Junction is expected to end in May.

Plans for construction of a pilot mill to handle thorium ore have been announced by the newly-formed Thorium Corporation of America, Grand Junction.

Thorium Corp. has leased 27 thorium claims in Gunnison County from Colonial Uranium Co., which owns a substantial interest in the thorium company.

Thorium development work also is being carried on by the Rare Earth Mining Co. in the Powderhorn area of Gunnison County. Rare Earth, operating with a DMEA loan of about $40,000, has found good mineralization by core drilling and now is driving a tunnel toward the vein. Work is being done under contract by

EDISON
SELF-SERVICE
...IN MINES EVERYWHERE★

Pick any mining area in the country, and you'll find—in large mines and small mines—Edison Self-Service installations of miners' cap lamps delivering maximum economy and efficiency for the operator.

There are good reasons for this *continuing acceptance* of Edison Self-Service. The simplicity of the system, demonstrated in these many mines over the years, answers the need for effective, minimum cost lamproom procedure. Miners serve themselves . . . move in and out of the lamproom without waste motion. All-important too, is the quality construction and design of the Edison Lamp. This quality translates minimum lamproom care into maximum underground performance. Miners work better, and safer.

You can profit from our long experience in Self-Service. And remember, the Edison Lamp Rental Plan means you can have Edison dependability without a major initial investment. We'll be happy to fill in the details. Write or call.

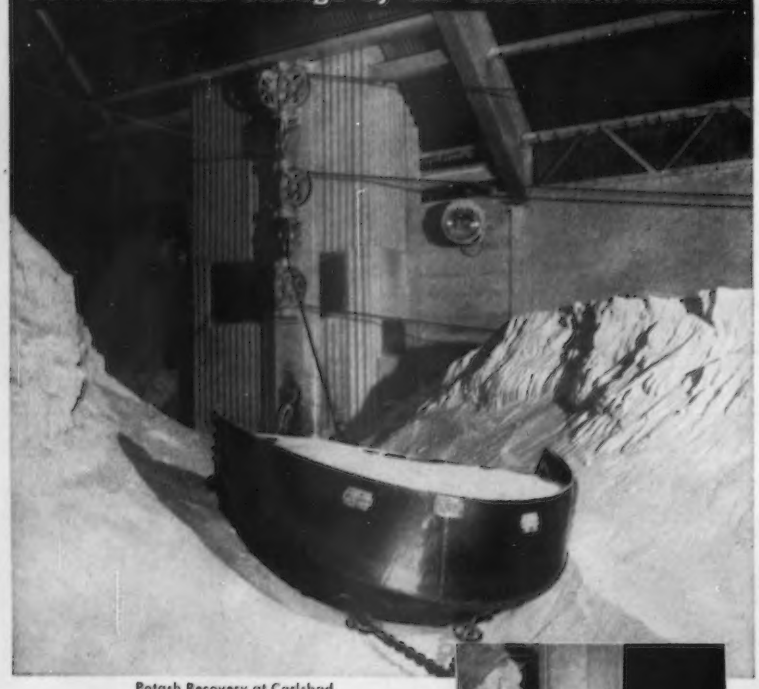
MSA
SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M·S·A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.
Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

Bulk Chemical Storage by the SAUERMAN Method



Potash Recovery at Carlsbad

Remote Control

How Sauerman Scraper Storage Reduces Costs

This prominent producer of basic chemicals uses Sauerman 1½-cu. yd. Scraper Machines to reclaim potash at 200 tph. Total area covered is approximately 125 by 370 ft. Building capacity is 60,000 tons.

Here's how a Sauerman Machine cuts costs:

One operator, located in a safe station overseeing the entire area, can recover practically 100% of all stockpiled material.

All highly machined parts, hoists and motors can be located outside of the building and protected from corrosion and dust.

When parts are replaced—sheaves, clutch or brake linings—the machine is restored to practically new condition, even though it may be twenty or more years old.

Only the Crescent scraper and cables contact the material. The scraper machine can be designed to operate the scraper on top of non-caving material. This allows the scraper to break down any high faces that may be standing.

Sauerman Storage Machines are built for hourly caacities of from 20 to 600 cu. yds. A partial list of chemical producers and manufacturers using some type of Sauerman equipment includes:

Consumers Cooperative Assn.
Crawford Chemical Co.
Davison Chemical Co.
Division of W. R. Grace & Co.
Duval Sulphur & Potash Co.
F. S. Royster Guano Co.
Hi-Yield Fertilizer Co.
International Minerals & Chemical Corp.
Lion Oil Co.
Mississippi Federated Cooperatives (AAL)
Meridian, Miss. Branch
Potash Company of America
Red Star Fertilizer Co.
Southern Agricultural Fertilizer Co.
Tennessee Farmers Cooperative
Virginia-Carolina Chemical Corp.

For ways to reduce your material handling costs, write to Sauerman's experienced engineers. Request Catalog E, *Bulk Storage by Scraper*, plus Field Report 227 and other reports on the handling of your material by Sauerman Machines.

SAUERMAN BROS. INC.

626 S. 28th Ave. | BELLWOOD, Ill.

Colorado *(Continued)*

Minerals Engineering Co. of Grand Junction.

Shawano Development Corp. of New York entered the uranium industry by acquiring more than 400 mining claims and other property held by the Paul Revere Uranium Co. Deal reportedly involved an exchange of $3-million in Shawano stock.

Shawano president Alexander Guerma of New York negotiated the transaction with Phillip Shaiman, president of Paul Revere.

Through the deal Shawano took over claims in the Four Corners area and in the Gas Hills of Wyoming, plus 2,000 acres of phosphate-bearing lands at Batesville, Ark., and Denver business property.

Stearns-Roger Manufacturing Co. of Denver has been named contractor for Union Oil Co.'s oil shale plant near Grand Valley.

Plant is expected to process 1,000 tons of shale per day as part of Union Oil's $5-million research program.

Uraniferous lignites are receiving increasing attention from the AEC.

Grand Junction operations office of the AEC disclosed it has asked for a ruling from the Interior Department on how persons may obtain rights to mine such lignites found on the public domain. Operations office also said the AEC will conduct exhaustive tests to develop satisfactory methods of recovering uranium from lignite.

Roden & McRae Drilling Corp. of Denver has paid $150,000 to W. L. Griffith of Denver for 11 uranium claims in Carpenter Flats near Uravan. Griffith property has been in production for a year.

J. M. Huber Corp. of Borger, Texas, advanced $195,000 to exercise an option on 19 uranium claims in western Fremont County, near Canon City, held by Crescent Uranium Mines, Inc.

Crescent spokesmen said a pilot shipment of five tons of ore from the property yielded $147 a ton, not including production bonus or allowance for vanadium.

Uranium from the Colorado Plateau some day may power the locomotives of one of the Plateau's most important railroads.

AEC has approved a proposal by the Denver & Rio Grande Western and the Baldwin-Lima-Hamilton Corp. to make a one-year study of an atomic-powered locomotive. AEC will aid in the study, to be financed by the two companies.

J. R. Simplot Co. has moved its Colorado uranium division offices from Norwood to Grand Junction. George A. McHugh, manager of mines, said Phillip T. Peterson would be manager of the Grand Junction office with Richard T. Zitting as staff geologist.

McHugh also announced Simplot has purchased the Nunn Co. of Overton, Nev., a silica mining, processing and marketing firm. Company has a plant capacity of 10,000 tons of high grade silica a month. It will be operated by Simplot Silica

Build Profitime . . . Cut Downtime

THAT'S right! You increase yardage and profits and keep your downtime at a minimum with rugged Firestone Nylon Off-The-Highway Tires.

Whether it's earth moving, rock work or strip mining, Firestone can supply a rugged nylon tire specifically engineered for the job.

It costs you less to run on Firestone Nylon Tires because the treads give maximum traction and they are extra tough to resist cutting. The sidewalls are double thick to give added protection against cuts and snags. The new Firestone Safety-Tensioned Gum-Dipped* nylon cord body has four extra tread plies to insure longer tire life and more retreads. The Firestone Safety-Tensioned Gum-Dipped nylon body gives the greatest protection against impact breaks . . . flex breaks . . . heat failures . . . and water damage.

Let your Firestone Dealer or Store show you how Firestone Nylon Off-The-Highway Tires will cut your downtime and increase your profits.

*T.M. Reg. U.S. Pat. Off.

America's Future Progress Depends on Better and Safer Highways

GROUND GRIP • ROCK GRIP • TRACTION ROCK • ALL TRACTION • ALL NON SKID • RIB EXCAVATOR

When you buy new equipment or replacement tires, specify FIRESTONE

Enjoy the Voice of Firestone on radio or television every Monday evening over ABC

Copyright 1955, The Firestone Tire & Rubber Co.

UNDERGROUND "OXYGEN TENT"

This 16-inch fan line of Naylor lightweight pipe brings clean, fresh air to diggings 3000 feet from the mine portal.

Naylor's exclusive lockseamed, spiralwelded structure makes it the perfect vehicle for push-pull ventilating jobs. It's light in weight, easy to handle and install—particularly with the Naylor one-piece Wedge-Lock coupling to speed connection. The spiral truss adds extra collapse strength and safety, permitting the use of lighter gauge steel without sacrificing strength.

For full details, write for Bulletin No. 507 on line pipe and Bulletin No. 514 on vent pipe couplings.

NAYLOR PIPE

Naylor Pipe Company • 1243 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Colorado *(Continued)*

Products, Inc., a newly formed Nevada corporation.

Intermountain Uranium Corp., which began mining operations on its Slick Rock properties in March, announced indications of "a large body" of commercial ore. Earlier 16 drill holes had showed mineralization. Ore is being stockpiled.

Southern Mohawk Oil-Uranium Producing Co. has arranged to do $65,000 worth of exploratory drilling on 23 claims jointly owned by Flanders Mining Co. and Southwestern Uranium Trading Corp. on Beaver Mesa. Southern Mohawk in return for drilling will take a half-interest in the claims, which are close to producing mines.

Uncompahgre Uranium Corp. reported a strike of lead-silver ore in the old Kansas City tunnel at Clear Creek. John Gaskill, president, said the ore is in pegmatite dikes. Three stopes are being worked with a crew of 16.

Verde Development Corp. has contracted with Clark Engineering Co. of Grand Junction to mine the Flat Top claims in the Yellow Cat district of Grand County, Utah. Mine is an open-pit operation.

Clyde Uranium Mines, a Seattle firm, has begun mining on its Bull Canon lease in Montrose County. C. R. Bellows, senior partner and geologist, is in charge of operations.

Silver receipts at the Denver mint were up in February while gold receipts were lower, both in the pattern of January receipts. Mint officials said that the inflow of gold from Utah has been reduced in recent weeks but was expected to be higher in the near future. Receipts of silver in February came to 271,627 oz valued at $243,743 compared with 178,228 oz worth $161,234 in February 1954. Gold receipts were down to 48,066 oz worth $1,682,331 from 63,531 oz valued at $2,223,600.

International Minerals & Chemical Corp. is now active with field investigation of uranium-thorium-rare earth showings, particularly along the Front Range of mountains, north and south of Canon City. Company owns the Consolidated Feldspar Co. which built the large, modern mill at Parkdale shut down for some four years. Company is hopeful that sufficiently large deposits of uranium-thorium-rare earth ores may be developed to justify reactivation of this mill for the beneficiation of such ores, and for setting up a purchase depot under AEC.

In addition to its Uravan uranium operations, Golden Cycle Corp. has acquired leases on approximately 2,000 acres of uranium ground located at the east end of Monogram Mesa. Superintendent Ben Slothower has been doing exploration work and drilling operations are under way. Drilling depths will vary from 300 to 700 ft and were started in the south end of the property at points where some "rim showings" are located. If the drilling discloses sufficient ore, a shaft will be sunk immediately.

TYPE F
STEELFLEX
COUPLING

- Any Size
- Any Service
- Any Application, Horizontal or Vertical
- Always available

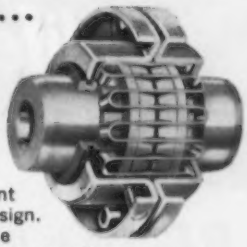
The exclusive grid-groove design of FALK Steelflex Couplings protects your machinery in two ways

You get double protection when you connect your driving and driven machinery with a Falk Steelflex Coupling—the all-steel-built coupling with the exclusive grid-groove design! First, its torsional resilience smothers shock and vibration; and second, the Steelflex design prevents damage and lowered efficiency by accommodating shaft misalignment.

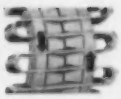
Why have increasing numbers of key men in industry standardized on Falk Steelflex Couplings? Their experience has proved that Falk Steelflex Couplings prolong the service life of their machinery...are trouble-free and need minimum maintenance...are easy to install, lubricate and disconnect ...and cost less per year of service than ordinary couplings.

One basic Steelflex design—the Type F, in its many sizes—is adaptable to more than 90% of all industrial applications. This facilitates buying, as well as prompt replacing and servicing when necessary. Write to Department 247 for engineering bulletin, including selection and dimension details.

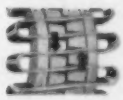
How shock and vibration are smothered by the FALK Steelflex Coupling's Torsional Resilience...



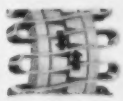
This cutaway view shows the sturdy all-steel construction, also the exclusive, torsionally resilient grid-groove design. Here is how the grid-groove design functions:



UNDER LIGHT LOADS The gridmember bears only at outer edges of grooves. The long span between points of contact remains free to flex under load variations.



UNDER NORMAL LOADS As load increases, the distance between supports on grooves is shortened proportionately, but a free span remains to cushion shock loads.



UNDER SHOCK LOADS Under extreme overloads, the gridmember bears fully on the grooves and transmits full load directly. The coupling remains flexible, within its rated capacity.

SHAFT MISALIGNMENT ACCOMMODATED
Free End Float Permitted

Controlled flexibility in the FALK Steelflex coupling provides compensation for parallel and angular shaft misalignment—and permits free end float for the shafts of the driving and driven members, or of either one.

PARALLEL MISALIGNMENT

ANGULAR MISALIGNMENT

FREE END FLOAT

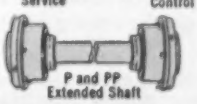
Rapid CM—Reversing Service

H and HH High Speeds

FS—Limited Space

BW—Brakewheel Service

FT—Overload Control



P and PP Extended Shaft

OTHER TYPES AVAILABLE

In addition to the standard Type F (which meets more than 90% of all applications), special or dual purpose Steelflex designs are available for unusual applications. A few of the many types are shown here.

THE FALK CORPORATION, Milwaukee 8, Wisconsin

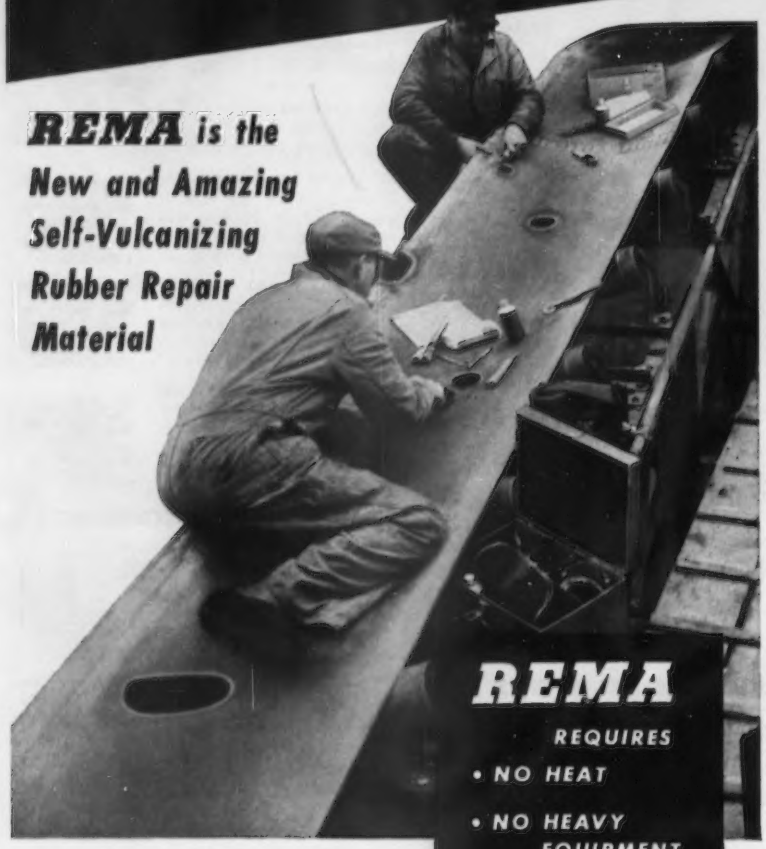
MANUFACTURERS OF

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

...a good name in industry

Use REMA to add years of life to your Belts


REMA is the New and Amazing Self-Vulcanizing Rubber Repair Material
REMA
REQUIRES
• NO HEAT
• NO HEAVY EQUIPMENT
• NO CURING TIME DELAY

▼ REMA is not just another cold patch. REMA is vulcanization by chemical process. The repaired area is sealed with an abrasive resistant cover stock patch. No heat or heavy vulcanizing equipment required. Here's the astonishing advantage —*when repair work is completed belts may be returned to service immediately.*

▼ REMA seals out moisture, reduces mildew, rot and deterioration —the great enemies of conveyor belts. Your own maintenance man can quickly repair your belts—it doesn't take a skilled belt mechanic to use REMA.

▼ Used for repair of all types of damaged spots, edge wear and for covering metallic joints. Available in introductory kits or parts separately.

Order from your Flexco-Alligator distributor.

Write for Folder No. R4

Flexible Steel Lacing Co., 4635 Lexington St., Chicago 44, Ill.

REMA SELF-VULCANIZING RUBBER REPAIR MATERIALS

Colorado *(Continued)*

William J. Carey and Climax Uranium Co. have entered into a joint exploration and development contract, under the terms of which Carey has agreed to spend $125,000 and $150,000 drilling core holes in search of uranium on claims owned by Climax. Carey is an independent oil operator with headquarters in Dallas, Texas. He has recently opened a district office in Grand Junction to supervise exploration of uranium and allied minerals on the Colorado Plateau.

Escalante mining area near Delta, has been completely staked by expectant prospectors and uranium firms and indications point to the development of the Delta area as a rich new mineral enterprise, a prominent operator said last week. Dee Sargent, Delta resident, said he sold 10 claims in Escalante, without providing royalty terms, in the hope of getting drilling operations under way as soon as possible. Purchaser of the claims was Bedrock Exploration and Development Co. of Tulsa, Okla.

Gold Sovereign Mine at Cripple Creek after being shut down following 18 months of operation and extensive development work by Gold Sovereign Leasing Co. Inc. was reopened. During the operation of the mine the old shaft was retimbered down to 700 ft and a new gallows frame and hoist house were erected.

IDAHO

Clayton Silver Mines has opened the south orebody on the new 550 level at its property in the Bayhorse District of Custer County, exposing a total length of 105 ft of ore. Crosscut toward the larger north orebody is over half way to objective and this area of the new level is expected to be in production during the latter part of this year.

Clayton officials report that during the latter part of March the area east of the Clayton property was the scene of a sizeable rush of claim-staking as the result of reports of radioactive finds. Local residents were reported to be working long hours against adverse snow conditions to get their claims staked.

Jeff L. Hayes of Nampa, veteran hard-rock miner and prospector, has reported the discovery of a uranium deposit on Robey Creek in Boise County which, in his judgment, is "the most important yet made in this part of the country." Outcropping of the orebody was found in April 1954. Subsequent bulldozing disclosed carnotite ore, samples of which assay "between 11 and 14%" uranium oxide, Hayes reported. Hayes and his partners have located a number of claims in the area and have leased several hundred additional acres.

Highland-Surprise Consolidated Mining Co. has entered into an operating agreement with Sidney Mining Co. under which the latter company will explore and develop as necessary the Highland-Surprise property from the bottom level

ONE EXTRA CYLINDER—and everything hauls smoothly

ATLAS COPCO AIR WINCHES

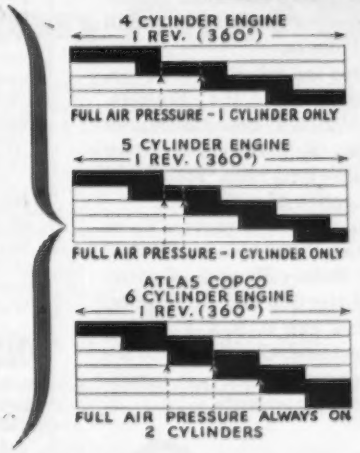
are made in a range of sizes to meet every need. Here is a series of light, powerful and easily portable winches especially developed for dragging, skidding or lifting in mines, quarries, industrial plants or on construction jobs. They are equally useful for moving and spotting cars at underground loading stations, shop yards etc. etc. They are simple to operate, maintain, and have a low air consumption. They can be easily and quickly moved from job to job and set up without delay. While they are very fast and smooth they can be run from creep to full speed under perfect control. All safety features required by the most stringent mine and industrial safety codes are fully covered.

Atlas Copco Air Winches are well worth knowing more about. For specifications, performance figures and detailed technical data, post the coupon below for illustrated leaflet.

ATLAS COPCO AIR WINCHES

—with six-cylinder radial piston engines

Some air winches have five-cylinder motors. Others, only four. Atlas Copco Air winches have **six.** That's the great thing about them. It not only means a compact motor and smoother hauling from creep to full speed, but a **much more powerful starting torque.** This is clearly illustrated by the accompanying tables. It will be seen that only the Atlas Copco six-cylinder motor always has complete power overlap on two cylinders.



Atlas Copco Compressed Air Equipment is manufactured or sold and serviced in 48 countries throughout the world by *The Atlas Copco Group*, which embraces companies trading under various names such as Atlas, Atlas Diesel, Atlas Polar, Atlas Copco, Copco, Delfos and Sampa.

**Manufacturers of Stationary and Portable Compressors, Rock-Drilling Equipment, Loaders, Pneumatic Tools and Paint-Spraying Equipment.*

THE ATLAS COPCO GROUP OF COMPANIES

POST THIS COUPON to the most convenient of the addresses given here:

U.S.A., Copco Pacific Ltd., 930 Brittan Avenue, San Carlos, California; Copco Eastern Ltd., P.O. Box 2568, Paterson 2, N.J.; CANADA, Canadian Copco Ltd., Montreal, A.M.F., Quebec; MEXICO, Atlas Copco Mexicana, S.A., Apartado Postal 56, Torreon, Coahuila; PERU, Compania Atlas del Peru, S.A., Apartado 2982, Lima.

UNITED KINGDOM, The Atlas Diesel Co. Ltd., Wembley, Middx.; FRANCE, Atlas Polar S.A., 29, Rue Marbeuf, Paris 8e; HOLLAND, N.V. Holland-Atlas, P.O. Box 6056, Rotterdam; ITALY, S.A.M.P.A., Viale Marche 15, Milan.

AUSTRALIA, Australian Atlas Company Pty., Limited, P.O. Box 54, Auburn, N.S.W.; SOUTH AFRICA, Delfos (Pty) Ltd., P.O. Box 504, Benoni, Transvaal.

Readers in countries outside those listed above and who do not know the name of their local Atlas Copco company or agent, please write, in the first instance, to AB Atlas Diesel, Stockholm 1, SWEDEN.

Please forward details of ***Atlas Copco Air Winches*** *(leaflet E.865)*

NAME _____

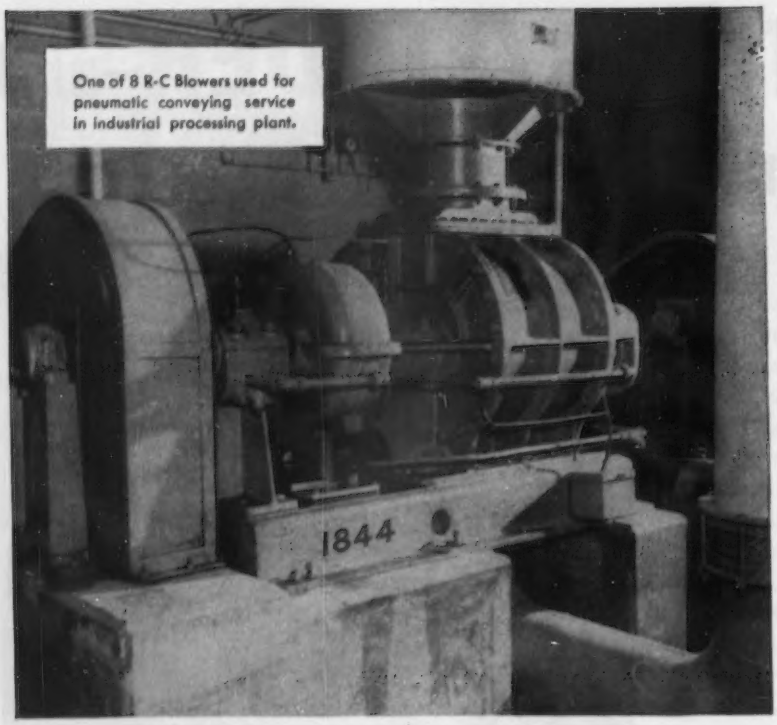
COMPANY _____

ADDRESS _____

_____

* I am also interested in other Atlas Copco Equipment (*please state which below*).

_____ /2



One of 8 R-C Blowers used for pneumatic conveying service in industrial processing plant.

No failures in volume or pressure with R-C Rotary Positive Blowers

CHECK THE "BIG 4" ESSENTIALS

1. Accurate volume at required pressure
2. High efficiency—low operating cost
3. Low maintenance cost —low down time
4. Freedom from oil or oil vapor contamination

Check your present blowers and if they don't measure up, it may be an economy to replace them with modern R-C equipment.

In any needed capacity, from 5 cfm to 50,000 cfm, R-C Rotary Positive Blowers faithfully and accurately deliver their rated volumes and pressures. That's one most important reason for their wide use in industrial plants.

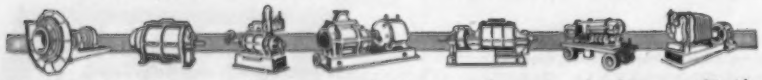
But there are other reasons, too, for the selection of R-C Blowers. The list of "BIG 4" essentials shows why sturdy R-C Rotary Positive Blowers have long been "standard" with thousands of purchasers.

If you have a job of moving air or gas, call the R-C engineer. With a choice of Rotary Positive, Centrifugal and the new Spiraxial units, he can give you unbiased counsel and suggestions. Or, ask for bulletins on equipment for new installations or replacements.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.
555 Washington Ave. • Connersville, Indiana

Roots-Connersville Blower (Canada) Ltd. • 629 Adelaide St. W., Toronto, Ont.



Centrifugal and Rotary Positive Blowers and Exhausters • Positive Displacement Meters • Vacuum Pumps • Gas Pumps • Inert Gas Generators • Spiraxial Compressors

Idaho *(Continued)*

of the Sidney shaft which is currently being deepened to the 2300 level.

Agreement provides that Sidney will be reimbursed for its exploration and development expenditures out of 90% of first profits from any ore found in Highland-Surprise property under the project. Following reimbursement of these costs, profits will be split 65% to Sidney and 35% to Highland-Surprise.

Highland-Surprise, which discontinued operations in its own workings last December, is now concentrating its attention on a uranium prospect in the Henry Mountains area of Garfield County, Utah, and a new lead-zinc prospect in Custer County, Idaho, near Stanley.

Drilling on the uranium property recently intersected a narrow bed of commercial-grade ore in the sixth test hole at a depth of 75 ft.

Whitedelf Mining and Development Co. has opened what is believed to be the downward extension of its south orebody on the new 800 ft level at its property near Clark Fork.

South drift entered the ore zone about 200 ft sooner than anticipated and the first 35 ft of advance in the ore zone exposed a 12- to 14-in. width of solid galena.

Uranium Holdings Inc. and Uranium Mines Inc., both Wallace companies, have joined in the acquisition of the Big Flat-Tucker Flat groups of claims in the Big Indian District of San Juan County, Utah. The two groups, totaling 30 claims and fractions, were purchased outright for an undisclosed amount reported to be in excess of $100,000. Uranium Holdings has a 75% interest and Uranium Mines a 25% interest.

National Uranium Corp. of Idaho has joined with Pathfinder Uranium of Salt Lake City in the exploration of a 43-claim property known as the Jarwell group in western Colorado, about 30 miles southwest of Grand Junction. Contract for 2500 ft of diamond drill exploration has been let and the program is now underway under the direction of Paul deVergie, Pathfinder geologist.

National Uranium also has a drilling program in progress on the several groups of claims in the Big Indian District of San Juan County, Utah, which it is exploring under a 60-40 profit-sharing agreement with Silver Buckle Mining Co. of Wallace.

A lead-silver ore shoot of commercial width and grade has been opened on the new 750 ft level at the Vindicator Silver-Lead Mining Co. property in the Coeur d'Alene District east of Mullan.

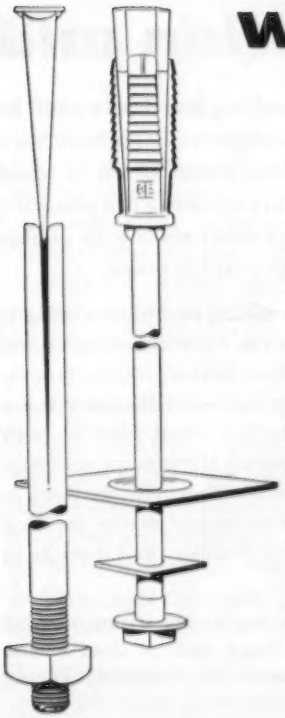
An east drift on a fissure vein structure 330 ft north of the shaft broke into the orebody about 40 ft east of the crosscut from the shaft and the first 42 ft of ore averaged about 2 ft in width and ran about 2 oz of silver to each per cent of lead.

West drift on the same vein is following a zone of quartz seams liberally mineralized with sulphides of lead and copper.

Vindicator project was started about a year ago by Silver Buckle Mining Co.

Up Goes Production...

When Roof Bolts Go In



When you equip your mine with roof bolts, production is increased because of the wider openings and clearances, and increased room in which to operate mechanized equipment. And with large, old-fashioned supports out of the way, ventilation is improved.

Roof bolts make larger work area possible, and permit a tight, sound roof, because they consolidate strata into a single-unit thick beam. With such roof control, the possibility of serious roof falls is minimized.

4 Types of Bethlehem Roof Bolts

Bethlehem produces four types of roof bolts, to enable operators to increase production, and promote safety.

SLOTTED BOLT. This husky 1 in. bolt has a centered slot which is made by forging, without any loss of metal. Other end of bolt has 5 in. of rolled threads. Bolt is used with steel wedge, which is forced deep into slot, expanding the bolt-ends, when bolt is driven in 1¼ in. hole. Bolt has truncated-cone point to prevent thread damage. Normally furnished with American Standard regular square nut, which is tightened against roof plate.

SQUARE-HEAD BOLTS. Three types: a ¼ in. carbon-type, and a ⅜ in. high-strength bolt, each with breaking load of 20,000 lb; also a ⅞ in. high-strength bolt with minimum breaking load of 40,000 lb. The ¼ in. and ⅜ in. bolts can be used with Bethlehem's matching-halves Type F expansion shell or the 4-leaf Type C expansion shell. The ⅞ in. bolt is for use with the Type F shell in 1½ in. hole.

HARDENED WASHERS. Bethlehem's hardened washer for use with headed bolts reduces the friction between bolt head and roof plate that occurs when high tension in the bolt produces excessive bearing pressure. With this washer, impact wrenches can be used freely, without galling or tearing of metal.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

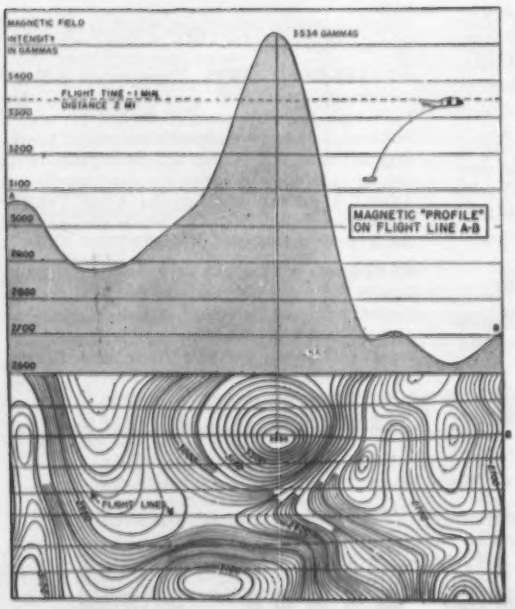
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Airborne Magnetometer at work near Johannesburg

New Aerial Methods can in Exploration and



Profile of an ore body

The high hopes that mineral exploration would be greatly aided by the airborne magnetometer have been realized. Pay-off finds are being made, often in blind areas. And mining engineers are speeding the planning and development for these and other areas with photo-reconnaissance and aerial topographic maps.

The most important new aid to mining exploration today is the airborne magnetometer. With it AERO is helping to uncover major new mineral finds in the United States, Canada, South America and Africa. A typical recent discovery was a massive magnetite body, at a depth of about 2,000 ft., with no surface expression. It was located through an aeromagnetic survey of 900,000 acres in eastern Pennsylvania, flown in 30 days. In Canada, the airborne magnetometer revealed another large magnetite body near Marmora and deposits in Labrador and other areas.

Magnetic peaks such as this, over an iron ore deposit, are recorded by the airborne magnetometer. Major finds of iron, nickel, titanium, and asbestos have been made with the aid of the flying magnetometer.

Photo-maps for reconnaissance ... topo maps to speed engineering plans

Swift, low-cost reconnaissance is obtained with air photos. They are useful for geologic study—and as photo-maps for plotting property lines and bore holes, locating spoil dumps, and other planning.

Richly detailed, dependable topographic maps are compiled by aerial methods at a fraction of the cost and time for ground surveys. They are used for all types of engineering planning.

save time and money Development programs

AERO'S experienced crews have aided the search for nickel, titanium, asbestos, iron, and other minerals. Exploration costs usually are only a few cents per acre. In a number of cases, the magnetic data was so direct and positive that claims parties were dispatched within 24 hours after the survey flights. In fact, the magnetic data often is so revealing that large mining companies find it to be worthwhile for their chief geologists to go into the field with the air survey group. At the advance base they evaluate and act upon the aeromagnetic data as it is collected day by day.

Supplementing the airborne magnetometer is another aerial survey tool—the mapping camera. At low cost it rapidly collects information about surface geology. The air photos are compiled in photomaps, which are used for broad exploration planning, to plot property lines and bore holes, to locate spoil dumps and reclamation areas, and for general planning.

AERO topographic maps further speed the mining engineer's planning. These maps are compiled at one-half of the cost and time of ground surveys (*or less*). They aid in the location of access roads, rail spurs, town sites, harbor facilities, and help with other development planning. AERO'S maps are so dependable they are used to estimate cut and fill for earthwork bids. Recent typical assignment: mapping Cerro Bolivar—2 meter contours, and scale of 1:1000. The maps will be used for engineering planning and management discussions.

These tested new aerial methods are especially valuable in first stages of mining exploration or development, when time and manpower saved can so greatly advance the date when actual mining operations begin. Our 35 years experience in exploration and mapping will be helpful to you.

AERO SERVICE CORPORATION
PHILADELPHIA 20

Oldest Flying Corporation in the World, whose crews are at work all over the globe on airborne magnetometer surveys, photomaps, topographic maps, relief models and Shoran-controlled mapping.

Idaho *(Continued)*

under a profit-sharing agreement with the Vindicator firm. It was carried out with the aid of a $114,750 DMEA loan and it included sinking a shaft to the 800 ft level.

Bunker Hill & Sullivan Mining & Concentrating Co. has encountered what is believed to be the downward extension of the Alhambra fault on the new 3110 ft level at its Crescent property on the west-slope of Big Creek between Wallace and Kellogg. A west drift now in progress along the structure shows some silver-bearing ore but not in commercial quantities. Alhambra fault was the principal ore-producing structure on upper levels of the mine.

MICHIGAN

Inland Steel Co.'s annual report informed stockholders that the company's Cayia mine at Crystal Falls was closed down permanently just as it was being brought into full production in April 1954. Sand and water from the overburden partially filled the mine, and since no safe and economical method of resuming operations could be devised, the mine had to be abandoned at a loss of approximately $600,000.

Sherwood mine at Mineral Hills and the Bristol mine at Crystal Falls of Inland Steel Co. began loading ore from underground into railroad cars March 21, in a snow storm. At that time the first Inland ore carrier was expected to arrive at Escanaba about April 4, but heavy ice conditions delayed the opening.

Fortune Lake mine near Crystal Falls owned by Pickands, Mather & Co., reopened in mid-March with a small crew working on two 8-hour shifts. Peter A. Kiewit & Sons of Omaha have the contract to strip the overburden and move the ore near the surface. Deeper ore will later be developed as an underground mine.

About 4,000 acres of state lands in north Delta County will be offered for iron ore lease. Delta County, of which Escanaba is the county seat, has no operating iron mines at present, but recent geophysical explorations have induced iron ore producers to request the lease of these lands.

Sunday Lake mine of Pickands, Mather & Co. at Wakefield of which R. D. Hodge is superintendent, operated for the year 1954 without a lost time accident. In that year the mine shipped 248,212 tons.

Minerals Beneficiation Upper Peninsula sub-section of AIME at Ishpeming, March 18, heard Harry H. Vaughan, Jones & Laughlin Steel Corp. research laboratory, give a paper on "Application of Statistics to Mineral Dressing and Mining." Francis X. Tartaron of J&L research laboratory is chairman of the sub-section, and N. H. Manderfield of the Michigan College of Mining & Technology is vice-chairman.

MINNESOTA

At a talk in Hibbing March 7, William Schmidt of Reserve Mining Co. said that Reserve would begin shipping concentrates from its new, permanent plant in August of this year. Plant is designed to produce 3¾-million tons of pellets per year. Due to low supply of water available in the Babbitt area, the concentration plant was located at Silver Bay on Lake Superior.

Schmidt said that when present and anticipated taconite concentration plants have attained a total output of from 30- to 40-million tons per year, they will have required a total investment exceeding the present valuation of the entire state.

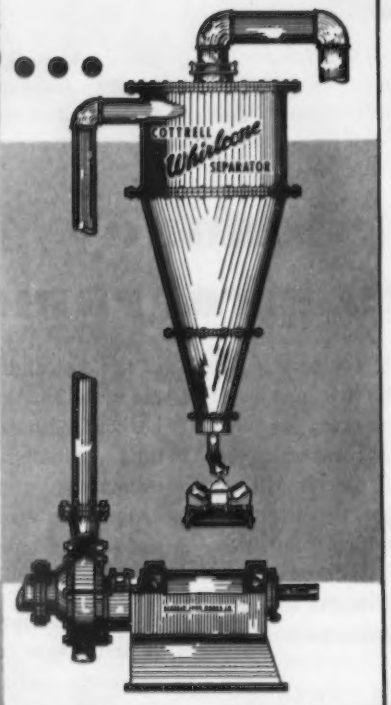
Work has begun on the W. S. Moore Co.'s new O'Brien mine located near O'Brien Creek between Keewatin and Nashwauk.

Leonidas mine near Eveleth, which was operated by the Oliver Iron Mining Division from 1908 to 1943 with ore shipments from stockpile in 1945 and 1947, was taken over by the North Range Mining Co. in 1953. Dewatering was begun in January 1954. Underground repairs and surface installations are about completed and production will resume this

Now You Can Recover Your Fines With This...

COTTRELL Whirlcone SEPARATOR PAT. PENDING

Thousands of tons of valuable sand in the minus 50 mesh range are lost with wash water in Sand Plants all over the world. The well-known Cottrell Whirlcone Separator will save this sand at small cost.



COTTRELL ENGINEERING CO.
DIVISION OF
GIW
GEORGIA IRON WORKS CO.
MARBURY ST., AUGUSTA, GA.

The Whirlcone will de-slime and dewater these fines with approximately 95% efficiency in the plus 200 mesh range. There is a GIW Slurry Pump and a Cottrell Whirlcone Separator combination to fit any plant flow sheet. If you are losing fines, let us have your inquiry giving approximately the volume of flow and the nature of the losses. Our recommendations and literature will follow.

GM DIESEL
CASE HISTORY No. 1A3-16

OWNER: Crowe Coal Company, Kansas City, Mo.

INSTALLATION: Six GM Diesel-powered Dart trucks . . . three 20-ton rear-dumps and three 40-ton bottom-dumps. GM Diesel-powered Bucyrus-Erie #38-B shovel with 2¼-yard bucket. The company also operates three 20-ton bottom-dumps powered with 4-cycle Diesels.

PERFORMANCE: GM Diesel-powered trucks have faster pickup, respond to throttle controls better, use less lube oil. Engines take less time—cost less to overhaul. Shovel strips 1000-1200 tons of coal in 7¼ hours—burns 4 gallons of fuel per hour.

Quicker Pickup-Faster Hauling

MISSOURI's Crowe Coal Company operates nine trucks—six powered by General Motors 2-cycle Diesels and three with 4-cycle Diesels. They report the GM Diesel-powered trucks "respond quicker, use less lube oil, are easy to overhaul."

A General Motors Diesel does "respond quicker." It gets more work done than most engines, partially because of its 2-cycle "power on every piston downstroke" design. It costs less to buy. It costs less to maintain because GM Diesel replacement parts cost less (valves up to 62% less and cylinder liners up to 40% less) than parts for comparable Diesels.

Today you can get GM Diesel power in more than 750 different models of equipment built by over 150 manufacturers. Call in your local GM Diesel distributor or write direct for more information.

It Pays to Standardize on

DETROIT DIESEL ENGINE DIVISION

GENERAL MOTORS • DETROIT 28, MICHIGAN

Single Engines . . . 30 to 300 H. P. Multiple Units . . . Up to 893 H. P.

GM GENERAL MOTORS DIESEL POWER

buell dust recovery really pays off, too!

BUELL ENGINEERS help you to get greater "returns" from your valuable industrial dusts because they deal in FACTS! Important, too, they give you *all* the facts before your company invests a cent.

WITHOUT OBLIGATION... Buell Engineers submit samples of your valuable dust to their laboratory for analysis... make a thorough, on-the-spot study of your operations!

THEY RECOMMEND from the complete line of Buell Dust Recovery Equipment the unit, or combination of units... that is most suitable for your operating conditions.

BUELL "SF" ELECTRIC PRECIPITATOR with its exclusive "Spiralectrodes" and continuous cycle rapping! Buell Cyclone Collector with its exclusive "shave-off" design! Buell PMV Non-Returning Hopper Valves with their positive sealing and self-cleaning features! These are just some of the reasons why Buell Engineers can offer you the ultimate in valuable dust recovery.

THEY TELL YOU EXACTLY HOW MUCH valuable dust can be recovered from your operation... before you become obligated in any way!

WHY WAIT? With "profits" to gain... nothing to lose... why not take advantage of this generous proposition right away?

WRITE TODAY for free booklet: The Collection and Recovery of Industrial Dusts—which clearly explains *all three* Buell Systems. Dept. 19-E, Buell Engineering Company, 70 Pine Street, New York 5, N. Y.

buell®

MECHANICAL ELECTRICAL *20 Years of Engineered Efficiency in* **DUST RECOVERY SYSTEMS**

Minnesota *(Continued)*

season. Estimated tonnage remaining is 3,158,000 tons. Nearly 20½-million tons have been shipped from the property. Alvin J. Guscatt is superintendent at the Leonidas and Ward Brown is mining captain.

Although no mining men at present are willing to be quoted as to 1955 season shipments, some "unofficial" predictions have been made. These vary from 70-million to 85-million tons. All agree that, as far as can be seen at this time, the 1955 season should be considerably above that of 1954.

Great Northern Iron Properties reports that shipments from its mines for 1954 amounted to 6,880,094 tons compared to 11,680,648 tons in 1953. Profits, before depletion, for the two years were $2.23 and $2.72.

M. A. Hanna Co.'s Maroco, Huntington and South Hillcrest mines have carried on rock stripping and the Portsmouth has had a stripping program in addition to a complete overhauling of its sintering plant. Plant is expected to produce 150,000 tons of sinter this season.

At Inland Steel Co.'s Armour No. 1 underground mine at Crosby, surface stockpiling has been done with a Dumptor truck, building up a grade from ground level.

Included in the annual report of Steep Rock Iron Mines, Ltd. for 1954 was information that when the "G" ore zone and the Errington No. 2 underground mine are brought into full production, company will have an annual productive capacity of 5½-million tons from them and the Hogarth open pit and Errington No. 1 underground. In addition it was anticipated that Inland Steel's Caland operation will have a minimum annual capacity of 3-million tons.

Inland Steel Co. subsidiary, Caland Ore Co. Ltd., has completed preparations for an intensive dredging program at its Steep Rock Iron Mines Ltd. lease on Falls Bay. Dredging will begin this spring with two huge dredges, the Clarence B. Randall and the Joseph L. Block. Work will be carried on continuously until completed, which may require five years. 150-million cu yd of mud and silt will be removed.

MONTANA

American Chrome Co., operating the Mouat Mine at Nye, Stillwater County, under Government contract, has produced 430,193 tons of ore and 171,745 tons of concentrates since it began operations in August 1953, according to John Bley, manager. Bley recently was elected second vice president of the Mining Association of Montana. Contract with the Government obligates the company to supply 900,000 tons of chromite concentrates in eight years and its production is a little ahead of schedule.

Bley further stated that research and development work is being carried on to

"Eucs" pace production at Nelson Crushed Stone Ltd.

Powered by a 300 h.p. engine with 10-speed transmission, this 22-ton Rear-Dump Euclid has a top travel speed of 32 m.p.h. with full payload . . . one of the reasons "Eucs" haul more tonnage at lower cost.

The limestone quarry and plant of Nelson Crushed Stone Ltd., north of Hamilton, Ontario, is one of Canada's newest and most modern operations. This stone plant, with a capacity of more than 500 tons per hour, was designed for maximum efficiency and flexibility—it can produce virtually any size stone.

Three 22-ton Rear-Dump "Eucs", loaded by a 2½ yd. shovel, haul dolomite to a primary crusher about ¼ mile from the face. Equipped with quarry bodies having flared sides that facilitate loading and minimize spillage, these "Eucs" have 300 h.p. engines and 10 speed transmissions.

Rear-Dump Euclids are standard off-the-highway hauling units in mines and quarries because of their ability to stay on the job year after year with low maintenance cost. For a production and cost estimate on your operation get in touch with your Euclid dealer . . . there's no cost or obligation.

Rugged construction of the body and frame enables "Eucs" to withstand the impact of loading rock and other heavy excavation with large loading equipment. Here a 2½ yd. shovel loads 22 tons of dolomite for haul to the primary crusher.

EUCLID DIVISION GENERAL MOTORS CORPORATION, Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

Montana *(Continued)*

make it profitable to continue operations after the Government contract has been filled.

Plans for a thorium mining and milling development that may cost from $4- to $5-million were disclosed at Dillon, Mont.

Rela Welborn and James Selway said they had sold 34 thorium claims near Dillon to G. N. George, head of the Wyoming Sulphur Co. of Cody, Wyo., and Harry Cain, New York financier.

The buyers, said Welborn, plan an initial development program that will cost about $200,000. If sufficient ore is found, he said, George and Cain plan a 200-ton concentration plant on the property and later a refining plant at Armstead or Dillon.

NEVADA

O. A. Power, Pocatello, Ida., mineral development officer of Westvaco mineral division, Food Machinery and Chemical Corp., reports his firm has obtained leases on barite properties at Battle Mountain from Glidden Co., Cleveland, Ohio.

Westvaco will work the properties, with production going to the firm's Modesto, Calif. barium reduction facilities.

Experimental test runs made on ore from the Combined Metals Reduction Co. mine at Caselton are proving successful, says Paul Gemmill, superintendent-manager. Several thousand tons of manganese ore have been mined and are ready for treatment by gravity method. At the same time Exploration Drilling Co., of Santa Fe, Calif., is carrying out an exploration program by deep hole drilling for lead-zinc ore on the south extension of the Prince Mine ore channel.

Nevada's Cordero mine in northern Humboldt County produced more than 25% of the nation's mercury output during 1954, according to the Bureau of Mines. Total national production was 18,500 flasks, Bureau said.

King Solomon Mining Co. of Las Vegas, has taken over the Peterson Antimony property 70 miles northeast of Tonopah and is preparing to erect a 50-ton mill on the site. Ore deposits consist of a good mill grade of antimony content approximating $14.50 in gold and silver, and about 0.4% selenium.

Kennecott Copper Corp. completed a three-year underground project during March when the last remaining 10 ft of earth separating the Deep Ruth Shaft and the Kellinske shaft at Ruth was removed. Complete traverse is 11,600 ft in length, and the underground tunnel measures 4200 ft. Major part of the work was done by Foley Brothers Construction Co. Water was encountered frequently, causing delay in operations.

Completion of the Bruhi Mill at Silver Peak in Nye County was scheduled for April, according to H. D. Easley, Hawthorne contractor. Production at the mine continued steadily throughout the winter months under Ernie Shirley, mine superintendent, and a large stockpile is available for milling.

Gypsum deposit near Lovelock has been purchased by Pabco Products, Inc., San Francisco, from Ideal Cement Co. of Denver.

Deposit will provide basic raw materials for products to be manufactured in a new plant to be constructed by Pabco to serve the northern California market.

NEW MEXICO

Thirty-five uranium mining operations have been registered with State Mine Inspector John Garcia.

While most of them are in northwestern New Mexico, some are registered from Socorro, Grant, Catron, Sierra and San Miguel Counties.

Kennecott's Copper Corp.'s Chino mines division has reorganized its safety and fire prevention organizations into one department under direction of Elmer L. Wiley, former safety director of West Virginia Coal and Coke Co. W. H. Goodrich, Chino general manager, said the reorganization will further intensify the company's efforts to increase safety.

SPANG

BLAST HOLE BITS

Drill More Holes Per Bit, At Less Cost Per Hole

SPANG CHURN DRILL BITS, famous for long life and economy in the drilling of blast holes for the fragmentation of minerals or overburden, drill *more-holes-per-bit* at *less-cost-per-hole,* because they are fully heat-treated from end to end and have the *extra strength in pin and blade sections* to stand up under the toughest drilling conditions. They are made with semi-dressed ends for quicker, easier finish-dressing, in High Carbon, A.I.S.I. 4340, and Spang Molloy Steel.

Available also, as an added economy, are SPANG REPLACEMENT BLADE SECTIONS in the same grades of steel, and uniform forge section, for welding to pin and collar sections of original bits when long service has worn the integral blade to a point where replacement is desirable.

Anyway you look at it, SPANG BITS are your best buy for more holes at less cost per hole.

SPANG REAMER TYPE PILOT BITS FOR DRILLING LARGE DIAMETER HOLES

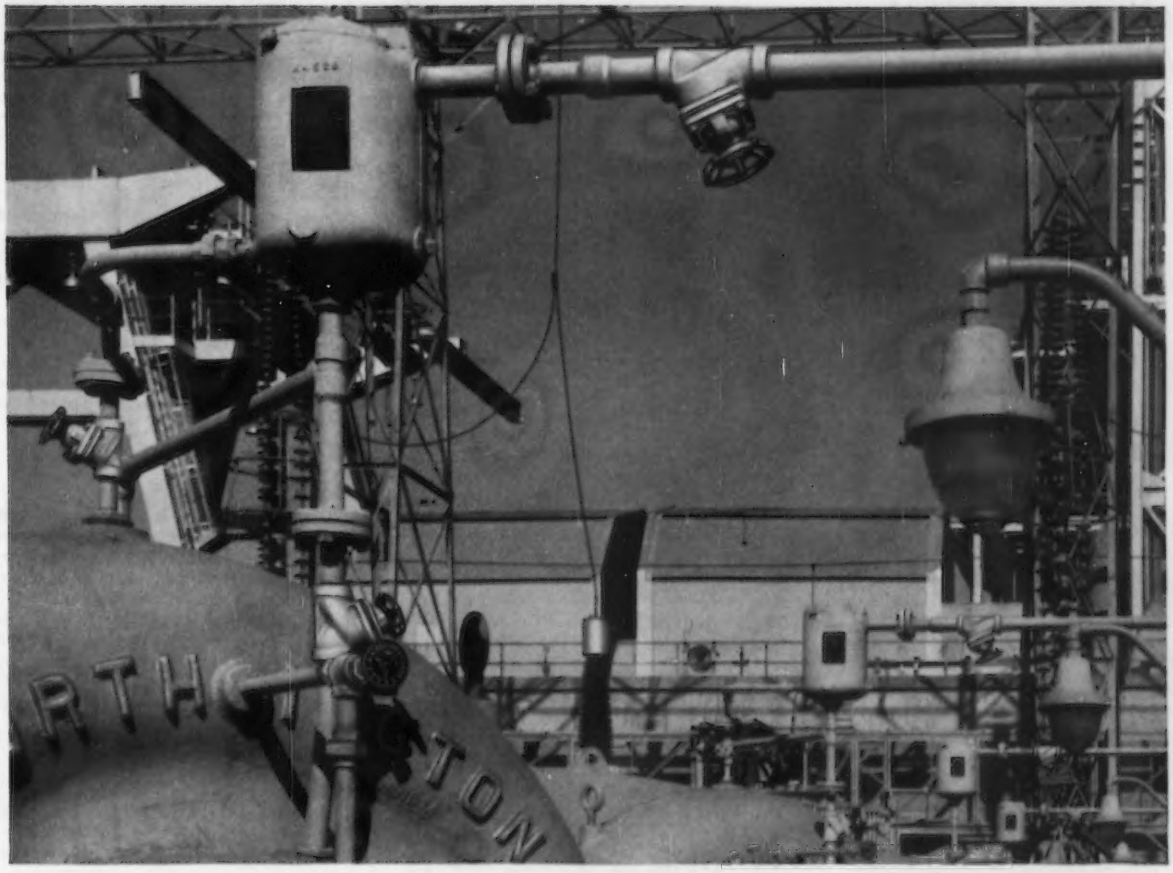
Can be supplied in all sizes and in any practical weight.

For information on SPANG BITS, and FREE CATALOG of Complete Line of SPANG Cable System Drilling and Fishing Tools, consult your nearest Dealer, or write direct to:

SPANG & COMPANY

DEPT. M-2 BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.



Corrosive circulating water tamed here by these CRANE VALVES

THE CASE HISTORY—Almost 2 years' operation without any maintenance of valves on circulating water lines to condensers, and on priming and instrumentation systems—with no trouble in sight. That's the experience of Southern California Edison Company's 280,000 k.w. steam station at Etiwanda with Crane Packless Diaphragm Valves.

The plant's engineers knew that sediment in recirculated water would quickly cut out the seats in ordinary valves and its corrosive elements would attack working parts to make valve operation difficult.

Not so with Crane Packless Diaphragm Valves. Their sealed bonnet keeps working parts out of contact with line fluid—free of corrosive effects. Separate disc construction with pliable insert resists erosion—seats tightly even on foreign particles. Large or small, these valves operate easily with fewer turns to the cycle. Typical Crane quality throughout—they're made better to do the job better—a bigger value for the thrifty buyer.

CRANE No. 1610 PACKLESS DIAPHRAGM VALVES

No packing to maintain. Neoprene diaphragm has longer life because it seals the bonnet only—is not subject to the cutting and crushing encountered when also required to do the seating. Separate disc gives control of fluid even should diaphragm fail. Wide selection of materials and sizes. Write for folder AD-1942 or see your Crane Representative.

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

NORTH CAROLINA

Shipments of dry-ground mica produced in the Spruce Pine district, or from scrap mined in the district, are reported to be running at all-time high rates.

There are no stocks of dry-ground of the grades needed, men in the industry say. Grinders report they are far behind in filling orders, with the usual peak demand of the year still ahead in most lines of industry using dry-ground as a raw material.

An unusually severe winter hindered operations of "jig" scrap mica recovery plants. Grinders depending mainly, or wholly on this source of scrap are said to be especially short of material.

All "jig" plants in the district are running to capacity.

North Carolina Resources Corp., Franklin, will begin diamond drilling to test depth of vermiculite ore at the Main Line mine in Macon County, according to announcement by R. G. Lichenstein, president.

Bidwell drift at the corporation's Corundum Hill mine is being reopened to expedite exploratory and development work. Bidwell formerly produced substantial amounts of corundum. None is reported produced in the U.S. now.

Southern Vermiculite Co. of Franklin has been purchased by Roy M. Biddle of Franklin, from Arthur I. Rank of Philadelphia, Pa., for an undisclosed price. Biddle said he would employ 10 to 12 men in operating the plant, which processes vermiculite ores.

Mining rights on the old Garner-Hill Gold Mine in the Sedgefield area of Guilford County have been transferred to Dacoru Exploration and Development Corp. of Forsyth County.

Lease has been transferred by William B. Dale and Bryce H. Cox, both of Winston-Salem. Owner of the land is Dorothy Charlton Dillard. Payment for the lease privileges was made in stock of the new corporation.

Actual Shaft Bottom Installation

Connellsville Electric - Automatic Man Cages

- Fully Automatic
- Push Button Control Panel Inside Cage (both levels)
- Door Controls—Limit Switch Operated—Cage won't move as long as door is open.
- Landing Door Controls
- Safety Escape Hatches
- Multiple Cables—Spring Mounted
- Tool Steel Wedge Type Safety Dogs
- Steel Rail Guide
- Installed complete with Hoist, Controls, Counterweight and Sheaves.

CONNELLSVILLE
MANUFACTURING & MINE SUPPLY CO.
CONNELLSVILLE, PA.
"SERVING THE MINING INDUSTRY SINCE 1901"

OREGON

Owners of the Nickel Ridge Group claims on Rough and Ready Mountain in Josephine County have started shipping high grade chromite ore from a small deposit in Nickel Ridge No. 1 mine. Ore assays about 52% Cr_2O_3 with 2.4 to 1 chrome-iron ratio. A minor amount of quartz boxwork and nickel laterite on the surface and some garnierite along fractures in the peridotite have been found.

UTAH

Hecla Mining Co. expected to have work under way by mid-May on a 650-ft, three-compartment shaft to the orebody on the Radon claims of the Utah & Idaho Uranium Corp. along the Lisbon Valley fault southeast of Moab.

Hecla will exploit the Radon group, where the orebody has been estimated at $20-million, and the nearby Hotrock claims under contract with U & I.

Superintendent Bill Love said shaft completion is expected in August.

Major Utah uranium discovery for March appeared to be the Big Indian Uranium Corp. strike in the Big Indian valley southeast of Moab.

Gordon C. Young, company director, said the first hole drilled under a program financed by a DMEA loan pierced a 12-ft bed of uranium after 108 ft of drilling. Drill also went through an 8-foot layer of copper mineralization above the uranium.

Twelve more holes were to be drilled under the DMEA program.

Director Milton H. Love of the Utah Securities Commission has expressed satisfaction at results achieved by uranium companies registered with his agency. Of 140 uranium companies registered, he said, 52 now are producing ore and the list of producers is growing almost daily.

Major claim deals announced in March included acquisition of 105 claims covering 2,100 acres in Grand and San Juan Counties by Moab Mines, Inc. President of Moab Mines is William J. Owen, a Moab geologist. In all the company holds 220 claims and two school land leases.

MARION 4161 SHOVELS

Stripping up to 100 feet of rock, these heavy-duty shovels have hard digging all the way. Tens of thousands of tons are loaded every 24 hours.

Look for MARION heavy-duty shovels where the hardest digging is involved on a year-after-year basis. Get the facts on these MARION machines — let our engineers show you what they can do in your mines.

MARION • OSGOOD • GENERAL O-G

MARION POWER SHOVEL CO. • MARION, OHIO, U. S. A.

A Subsidiary of Merritt-Chapman & Scott Corporation

POWER SHOVELS FROM ½ TO 60 CUBIC YARDS
PILE DRIVERS • WALKING DRAGLINES

DRAGLINES • CLAMSHELLS • CRANES • BACKHOES
TRUCK CRANES • MOBILCRANES • LOG LOADERS

Your Confidence Is Justified Where This Flag Flies

SPECIFY

FLEXIPIPE® the quality ventilating tubing

Flexipipe is now available with Rope Seam Suspension *at no additional cost.* The newest, best, quickest suspension . . . eliminates special accessories and suspension wires . . . *all you need is a nail.* It equalizes strain on the tubing.

Flexipipe is efficient, serviceable, economical. Jute and heavy-duty grades available in a variety of lengths and diameters to meet your requirements.

Write for complete information and sample.

Bemis Bro. Bag Co.

408-E Pine St.,

St. Louis 2, Mo.

4-wheel drive does another job better!

PROSPECTING

This Universal 'Jeep' equipped with self-powered drill goes wherever there is need for an earth-boring job. With the extra traction of its 4-wheel drive and high maneuverability, it reaches locations too tough for ordinary vehicles. Power for the drill is supplied from the 'Jeep' engine through power take-off. Get the full story of this self-propelled, self-powered drill that does everything from prospecting to soil sampling. See your nearest Willys dealer or write for information.

4-WHEEL-DRIVE UNIVERSAL 'Jeep'®

A member of the 'Jeep' family . . . world's largest-selling 4-wheel-drive vehicles

Willys Motors, Inc., Toledo 1, Ohio

Utah *(Continued)*

Consolidated Uranium Mines, Inc., major producer on the Colorado Plateau, is expanding its tungsten, copper and titanium operations as well as its uranium production.

President E. G. Frawley said Consolidated and its subsidiary, General Metals Corp., will be producing 15,000 tons of ore a month by late summer.

Frawley said the mill at the Gun Metal tungsten mine in Mineral County, Nev., was being expanded to handle over 200 tons a day. Daily production of 200-250 tons also is expected at the Linka tungsten mine near Austin, Nev.

Titanium property Consolidated is considering adjoins that of Republic Steel Corp. in Mexico. Consolidated also expected to start working copper property in Sandoval County, N. M., this spring.

Ula Uranium Corp. is sinking an incline shaft and driving a tunnel on its Red Canyon mine in the White Canyon district of San Juan County, where drilling has blocked out an orebody estimated at 900,000 tons. A. W. Hutchings of Blanding, Ula president, said samples indicated the ore would run 0.40% uranium oxide.

Part of the uranium ore stockpile at the AEC's Monticello, Utah mill is being transferred to the Kerr-McGee mill at Shiprock, N. M., under a contract signed with George Smith Jr., of Cortez, Colo.

Marion Bolton, manager of mining and exploration for Kerr-McGee, said the contract involves over $200,000 and that it will take a year to complete the hauling.

An AEC official said the move might indicate that some ore not amenable to present Monticello processes is being moved to a plant which can handle it, and that the Shiprock plant is in need of more ore for processing at the present time.

Atlas Uranium Corp. has started a second drift at its Brown's Hole mine in San Juan County where ore was encountered late in January. Atlas president J. C. Burgess said the first shipment of 11,700 lb from the initial drift assayed 0.47% uranium oxide and 2.34% vanadium, and later shipments upheld that average.

Discovery of what appears to be a continuation of the old Columbus Consolidated orebody at Alta, 18 miles east of Salt Lake City, has been reported by Olympic Uranium Co. which is leasing the property.

President Walter W. Jacobson of Olympic said the newly-found deposit is 3 ft thick, running high in lead with good silver and copper values.

Columbus orebody has been sought since 1915, when it disappeared into a 1,000-ft fault-shear zone.

Paramount Uranium Corp. expected to start shipping ore in late April from its mine in Montezuma canyon, 17 miles southeast of Monticello.

Uranus, Inc., shipped a carload of 46 tons of 0.27% uranium ore from Green River to the Vitro Corp mill in Salt Lake City. Uranus properties are on the San Rafael

Swell. Henry Gorman is mine superintendent.

Vitro Minerals Corp. has begun drilling 30 claims 12 miles south of Green River leased from Uranium Services, Inc.

United Park City Mines Co. reports it has cut substantial losses and is uncovering more than one ton of new reserves for every ton of lead-silver-zinc ore mined at its Park City properties.

John M. Wallace, company president, told stockholders that:

1. The firm formed through merger of Silver King Coalition Mines Co. and Park Utah Consolidated Mines Co. in 1953 had a net loss of $182,995 last year as against a loss of $202,757 for the period May 8-Dec. 31, 1954.

2. Production last year was attained during only last four months of 1954, during which a $30,000 a month drain was changed into restoration of $100,000 to the treasury.

Standard Ore and Alloys Co. has taken a 50% interest in the Dream and Burr Trail group of claims of the Congo Uranium Co., Garfield County. A drilling exploration program is under way.

Big Horn Uranium Corp., Salt Lake City, and Newam Co., Vancouver, B. C. affiliate of Pioneer Goldmines, Inc., have signed an agreement leading to driving of an 1800-ft tunnel in the White Canyon district, San Juan County.

Richard Y. Bennion, president of Utah Premier Uranium Co. reports the firm has made application for a $172,000 DMEA loan now in stage of field processing. Properties are in Big Indian District, San Juan County.

Merger of Big Indian Mines, Inc. into Standard Uranium Corp., New York City, has been approved by directors of the two firms.

Big Indian had previously agreed on a joint venture deal with Uranium Reduction Co., Salt Lake City, for exploitation of seven claims adjoining the Mi Vida Mine of Utex Exploration Co.

Under this agreement executed last fall, URC puts up $500,000 in development and exploration allowance. Under the new agreement, Standard inherits the joint venture with URC—the firm which is now completing negotiations with AEC for construction of a big uranium mill at Moab.

Correction: Standard Uranium Co. plans production of more than 100 tons of uranium ore daily from its properties in the Big Indian District.

Firm is now producing at a rate of 40 tpd, but with delivery of a Gismo, it is expected that output will be hiked. Shipments go to Moab buying station and Monticello mill. (Foregoing was reported in E&MJ, April 1955, and contained an error.)

WASHINGTON

Chewelah Copper Co. has stockpiled 2,000 tons of copper concentrates and will begin milling immediately at its mill near Palmer siding.

Every 4-wheel-drive used for Highway driving should have

WARN HUBS

PATENTED

WARN HUBS
- REDUCE FRONT END WEAR 50% OR MORE!
- SAVE ENGINES!
- SAVE GAS, TIRES!

ASK YOUR DEALER FOR FREE DEMONSTRATION

TO STOP FRONT END DRAG when used in 2 w. d. range—

TO STOP AXLE TORQUE* when used in 4 w. d. high range!

With Warn Hubs, the front end stands still in 2 w. d. range. The front wheels coast—there's no drag, no whine, no shimmy! 4-wheel-drives have all the pep, speed, handling ease and economy of pick-ups—can be used as such without wearing out the front end gears or overworking the engine. Besides, Warn *Automatic** Hubs also stop axle torque, permit high road speeds in 4 w. d. high range—a real advantage on *or off* the highway! You have *plus performance in both 2 and 4 wheel drive!* Use either 2 or 4 wheel drive—anytime—as you shift gears with Warn *Automatic* models, manually with *Locking* models. Fully guaranteed. Over 60,000 sets in use around the world. Willys models factory approved, sold *only* by Willys dealers world wide. Dodge, GMC, other 4 W. Ds. at truck dealers, or write:

WARN MFG. CO. Riverton Box 6064 EMJ SEATTLE 88, WASH.

4-wheel drive does another job better!

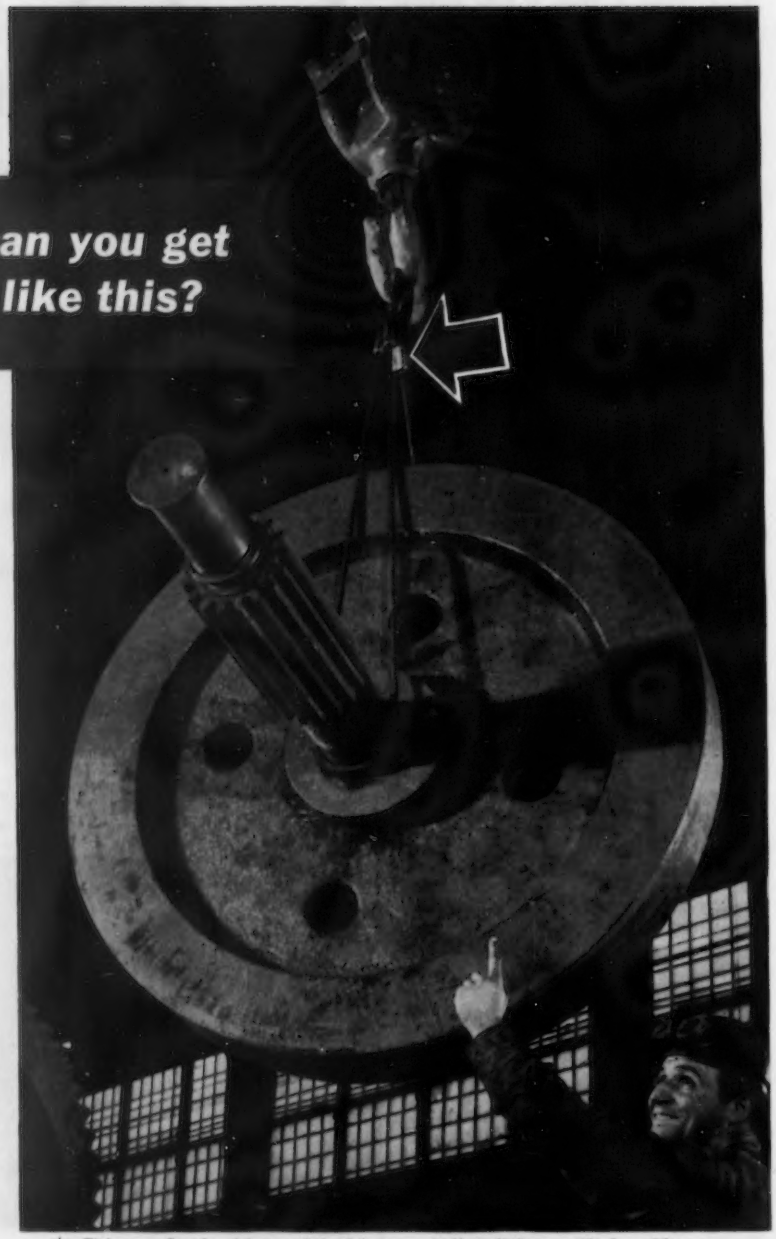
REACHING REMOTE WORK SITES

Beyond the road's end, where the going is rough and steep, you can depend on the sure-footed 4-wheel-drive pulling power of the Universal 'Jeep' to take you to the job. With a 'Jeep' you can climb steep grades, maneuver through dense woods, drive through loose rock and sand—*and get there!* That's why the 'Jeep' has become essential equipment for engineers, contractors, geologists, miners and lumbermen. See your Willys dealer or write for information.

4-WHEEL-DRIVE UNIVERSAL 'Jeep'®

A member of the 'Jeep' family, world's largest-selling 4-wheel-drive vehicles

Willys Motors, Inc., Toledo 1, Ohio, U. S. A.



7½ ton flywheel being lifted by two ⅜" JalKlamp Choker Slings.

More strength at lower cost— with JalKlamp

Here's the newest way to cut your materials handling costs.

J&L can furnish safer, stronger wire rope slings and terminals *at lower cost* thanks to JalKlamp, the new sleeve for wire rope splicing, exclusive with J&L.

The reason: non-corrosive JalKlamps are made from a special alloy. When hydraulically pressed around the rope, this alloy flows into the spaces between the wires and strands . . . produces a neat, permanent, watertight splice that's stronger than any tucked splice. And, because they're machine made, JalKlamp splices cost less.

JalKlamp slings and terminals are available for all standard wire rope constructions and in diameters ranging from ⅛" through 2", with SpringKore, Plasti-Kore, Fiber Core, and Independent Wire Rope Centers.

Specify JalKlamp slings and terminals and get these features:

1. High Strength
2. Economy
3. Non-Corrosive
4. Water Tight
5. Permanent
6. Neat, Safe — no jagged ends

Jones & Laughlin Steel Corporation
412 Gateway Center,
Pittsburgh 30, Pa.

☐ Please send me a free copy of your JalKlamp booklet.

Name_____

Company_____

Address_____

_____

J&L STEEL

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

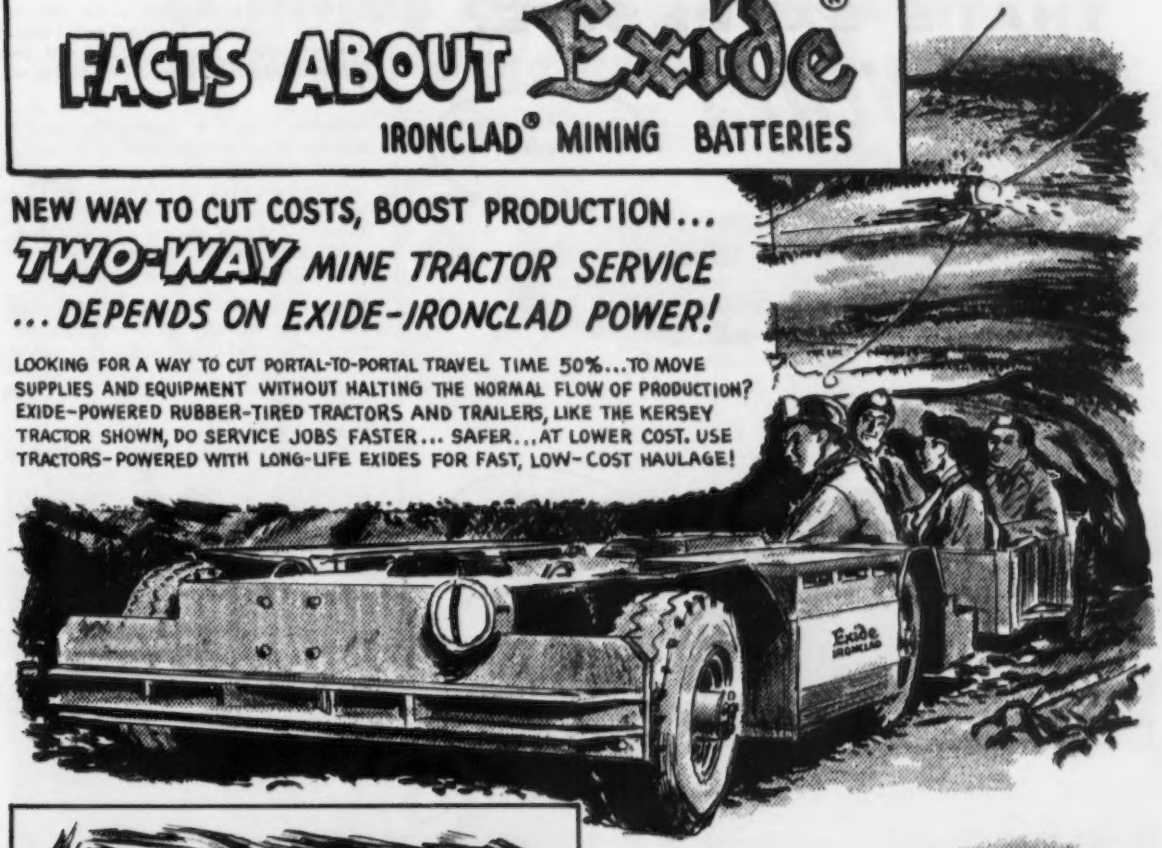
FACTS ABOUT Exide®

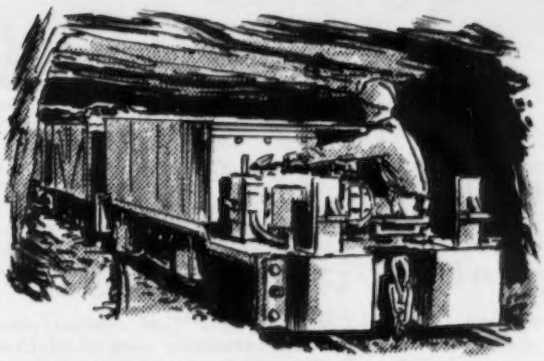
IRONCLAD® MINING BATTERIES

NEW WAY TO CUT COSTS, BOOST PRODUCTION...

TWO-WAY MINE TRACTOR SERVICE ...DEPENDS ON EXIDE-IRONCLAD POWER!

LOOKING FOR A WAY TO CUT PORTAL-TO-PORTAL TRAVEL TIME 50%...TO MOVE SUPPLIES AND EQUIPMENT WITHOUT HALTING THE NORMAL FLOW OF PRODUCTION? EXIDE-POWERED RUBBER-TIRED TRACTORS AND TRAILERS, LIKE THE KERSEY TRACTOR SHOWN, DO SERVICE JOBS FASTER... SAFER...AT LOWER COST. USE TRACTORS-POWERED WITH LONG-LIFE EXIDES FOR FAST, LOW-COST HAULAGE!





MORE TRIPS PER SHIFT! WITH DEPENDABLE EXIDE-IRONCLADS...

CAR CHANGES ARE SPEEDED, LOADERS KEPT BUSY, AND HAULAGE MOVES FAST WHEN LOCOMOTIVES ARE POWERED WITH EXIDE-IRONCLADS. EQUIPMENT WORKS FULL-SHIFT, DOWN-TIME IS ELIMINATED. YOU GET MORE PRODUCTION PER MAN-HOUR WITH LESS COST PER TON HANDLED. DEPENDABILITY AND LONG USEFUL LIFE MAKE EXIDE-IRONCLADS YOUR BEST POWER BUY-

AT ANY PRICE!

WORKED TO DEATH TO LEARN SECRET OF LONGER LIFE...

LAB TESTS OF IRONCLADS AGAINST CONVENTIONAL BATTERIES SHOW THAT THEY PERFORM BETTER... HAVE FROM 20% TO 30% LONGER LIFE! THESE FACTS, DEMONSTRATED BY THOUSANDS OF BATTERY USERS, EXPLAIN WHY EXIDE-IRONCLADS ARE YOUR BEST MINING BATTERY BUY-**AT ANY PRICE!** SINCE 1910, RESEARCHERS HAVE GREATLY IMPROVED EXIDE-IRONCLAD PERFORMANCE AND USEFUL WORKING LIFE, BUT THE BASIC IRONCLAD PRINCIPLE OF TUBULAR CONSTRUCTION REMAINS THE SAME.

LET EXIDE HELP SOLVE YOUR MINING BATTERY PROBLEMS. ❶ CALL AN EXIDE SALES ENGINEER FOR FULL DETAILS. ❷ WRITE FOR FORM 1982, A MANUAL ON MAINTAINING MOTIVE POWER BATTERIES.

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

A PUMP PACKING THAT'S EXPENSIVE, BUT *CHEAP!*

Heavy Teflon† impregnation throughout
Choice of Canadian white asbestos or blue African asbestos
Unique LATTICE BRAID* construction plus Teflon core

Lasts at least 3 times longer than ordinary pump packings

Frankly, the service reports on LATTICE BRAID asbestos packing with Teflon surprised us! Originally designed and test-proven for use against severe acids, caustics, and other chemicals, this particular packing has out-performed other packings (*even our own*) on more common applications against water, steam, solvents, and oils.

And here's why: (1) The LATTICE BRAID construction gives greater strength; (2) The Teflon core and heavy Teflon impregnation resist everything except molten alkali metals and some freons; (3) It does not adhere to the shaft or rod; (4) It runs smoother and freer than packings without Teflon.

Check these typical service reports:

- Against blending waxes and steam (for cleaning), it outlasted another Garlock style 10 to 1
- Against caustic at 325°F., 50 p.s.i., it outlasted competitive packing 38 to 1
- Against cold water, it out-performed other packings 3 to 1

LATTICE BRAID with Teflon is available in either Canadian white asbestos (style 5861) or blue African asbestos (style 5880). Each is furnished in packing sizes 5/16" to 1½" graduated by sixteenths.

Try an order of 10 feet or more today. Chances are you can *reduce* down-time, maintenance and replacement costs to *one-third* of their present amount.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo Chicago • Cincinnati • Cleveland • Denver • Detroit • Houston Los Angeles • New Orleans • New York City • Palmyra (N.Y.) Philadelphia • Pittsburgh • Portland (Oregon) • Salt Lake City • San Francisco • St. Louis • Seattle • Spokane • Tulsa.
In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.
*Registered Trademark †The Du Pont Company's Trademark

GARLOCK LATTICE BRAID with TEFLON

Washington *(Continued)*

Ore is being produced at the rate of 100 tpd from the Amazon and United Copper claims. Diamond drillers at the Keystone claim have uncovered a vein 40 ft wide.

Metaline Mining & Leasing Co. listed a net loss of $12,949 for 1954 in its annual report. Firm showed no income because development work was suspended in 1953 at its zinc-lead mine in Pend Oreille County. Sullivan Mining Co. had been working the property but discontinued operations until metals prices improved.

Pend Oreille Mines & Metals Co. mined and milled 482,000 tons of lead and zinc ore during 1954, according to its annual report. This is almost as much as the 1953 total. In February 1954 the report shows Pend Orielle earned $65,000 more than in February the preceding year.

Firm is 21% owned by Hecla Mining and 15% by Bunker Hill & Sullivan. During 1954, Pend Oreille paid Hecla $123,674 in dividends.

About 15,000 tons of copper-silver-gold-tungsten ore was blocked out in 1954 at the Kromona Mines development in Snohomish County. J. F. Krom, president, said the ore should operate the company's mill for about six months at 100 tpd.

Development last year yielded 102 tons of copper concentrates netting $13,191 and about 1,500 lb of rough tungsten concentrates still to be marketed. Company bought more than $94,000 worth of new equipment. Development work included 1500 ft of tunnel and raising, and eight exploratory raises begun in good ore.

Talisman Mining & Leasing Co. of Spokane is planning to start shipping its stockpiled uranium ore in Utah as soon as weather permits, Joseph S. Skorupski, president, reported. Ore being mined by open-cut stripping by a 3-man crew is coming from a 6-claim group in Uintah County. Company has also acquired 5 claims in the Big Indian district of San Juan County, 3 claims in the Coal Bed Canyon of the same county and 10 claims in Rio Blanco County in Colorado.

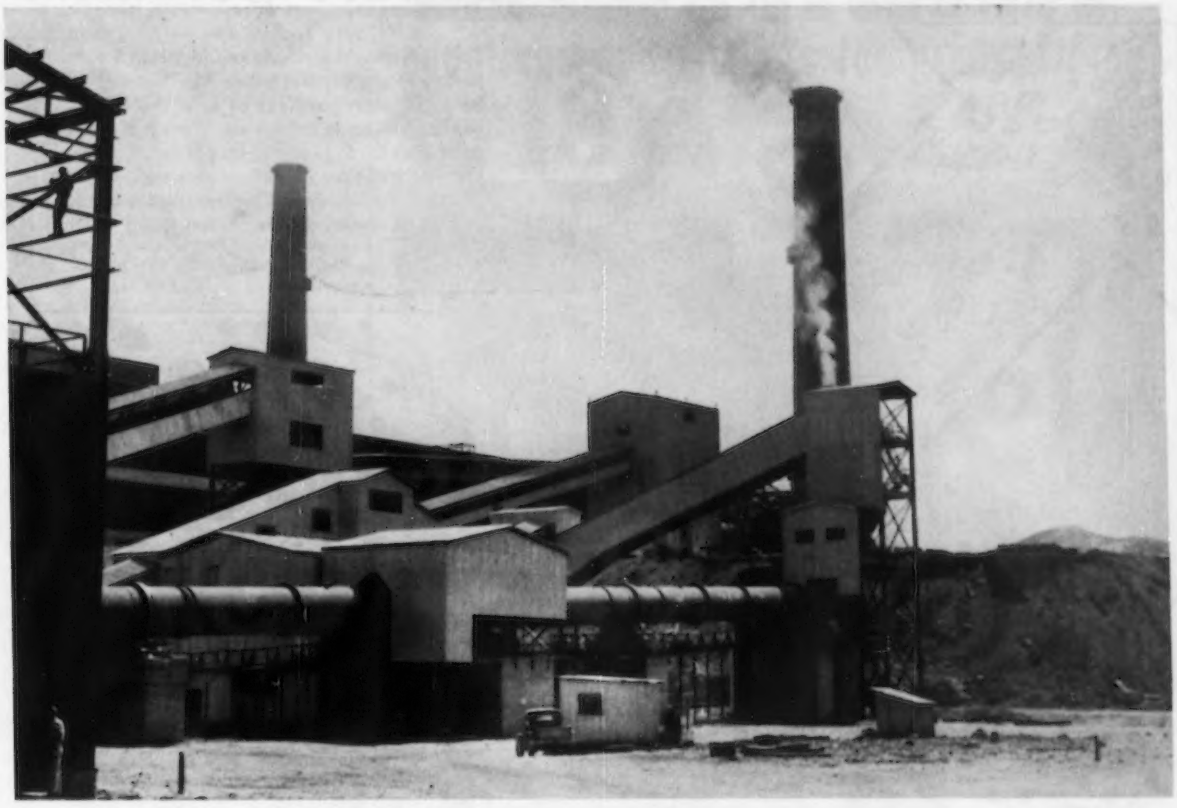
Cornucopia Gold Mines, Spokane, plans extensive exploratory work at its Utah holdings. Of its 169 claims acquired last year work was done on a 4-claim group and showings of uranium were found but not in commercial quantities. However, the report was favorable enough, according to Carl M. Stolle, president, so that additional examinations will be made as soon as weather is favorable.

A joint venture, known as CAC, is being participated in by Cornucopia, Alabama-California Gold Mines and Columbia Uranium, Inc. Companies are exploring claims in the Green River district, which are owned separately by the firms. Initial work was in Soda Springs basin and roads are being built to drill sites in the Holman Springs basin.

It has been reported that Howe Sound Co.'s long drift on the horizon of the main haulage level at its Holden mine in the Lake Chelan district, was advanced

6 miles of "know-how"

offer a short-cut to profitable thermo-processing



OVER 150 TRAYLOR KILNS are your best assurance of an efficient installation

Traylor has built over 150 Rotary Kilns since 1941 . . . an average of almost one a month for 14 years. Their combined length is over 33,000 feet. This adds up to more than 6 miles of kiln building "know-how" for Traylor.

Kilns have been "Traylor-made" for processing some 21 different products. The answer to many new thermo-processing problems has been found in Traylor's accumulation of kiln-building experience. If you are responsible for efficient thermo-processing in your plant, take the short cut to a profitable installation. Avoid the long costly way of trial and error. Have a kiln "Traylor-made" for the job. Write for bulletin 1115 today.

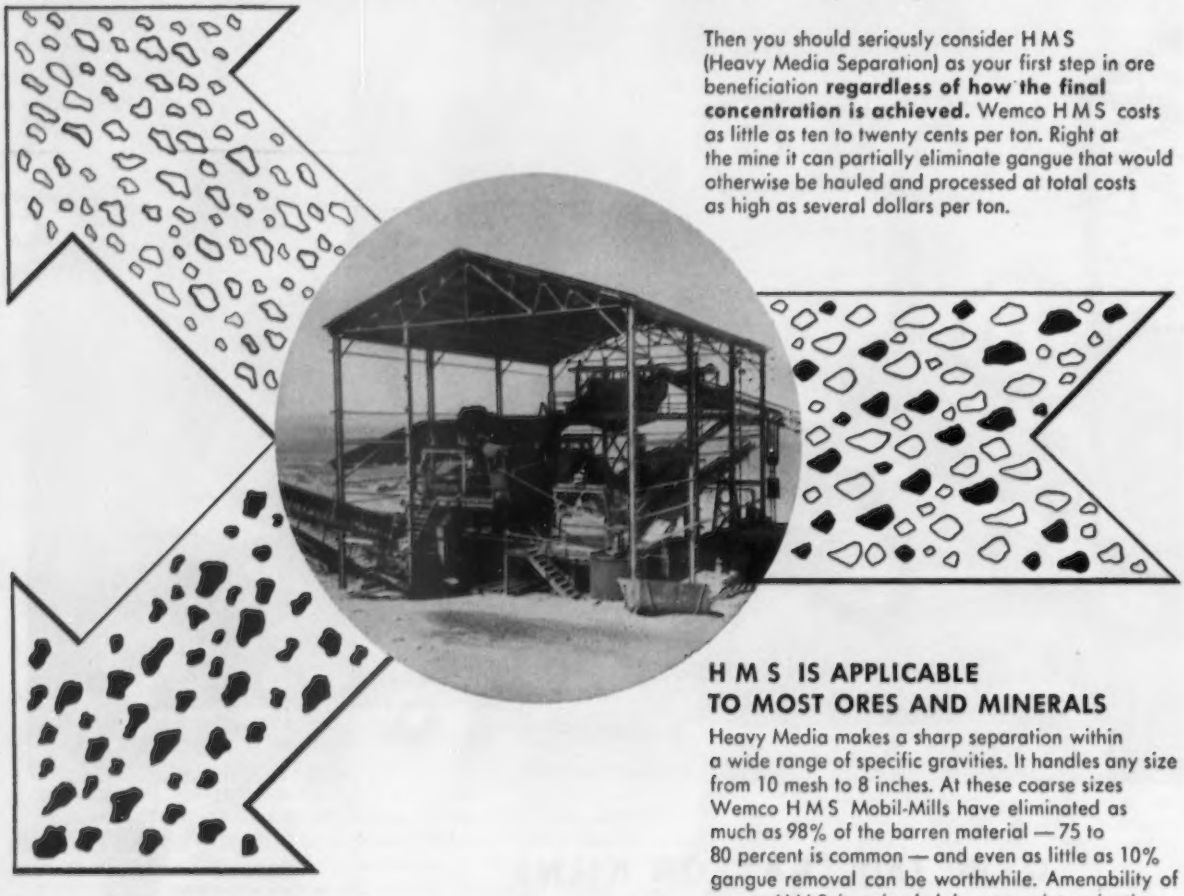
TRAYLOR ENGINEERING & MFG. CO.
762 Mill St., Allentown, Pa.
Canadian Mfrs.: Canadian Vickers, Ltd., Montreal, P. Q.

A Traylor leads to greater profits

SEND FOR BULLETINS
. . . just mention the Traylor Equipment that interests you.

SALES OFFICES · NEW YORK · CHICAGO · SAN FRANCISCO

WOULD YOU SPEND 15¢ to save dollars per ton?



Then you should seriously consider H M S (Heavy Media Separation) as your first step in ore beneficiation **regardless of how the final concentration is achieved.** Wemco H M S costs as little as ten to twenty cents per ton. Right at the mine it can partially eliminate gangue that would otherwise be hauled and processed at total costs as high as several dollars per ton.

H M S IS APPLICABLE TO MOST ORES AND MINERALS

Heavy Media makes a sharp separation within a wide range of specific gravities. It handles any size from 10 mesh to 8 inches. At these coarse sizes Wemco H M S Mobil-Mills have eliminated as much as 98% of the barren material — 75 to 80 percent is common — and even as little as 10% gangue removal can be worthwhile. Amenability of ores to H M S is a simple laboratory determination. Wemco offers this service.

WEMCO'S H M S MOBIL-MILL IS A PROVEN COST SAVER

The Wemco Mobil-Mill is H M S in its most practical form. The cost is predetermined and low because it is a complete plant that is pre-engineered and pre-fabricated. It can be assembled close to the mine (or even underground). And, the Wemco Mobil-Mill is so thoroughly proven in design that it operates from the first day. Mobil-Mills are available to fit your problem exactly. Capacities range from 5 to 500 tons per hour.

Wemco has built over 50% of all the H M S plants in use today. This experience can help you. Wemco welcomes your inquiry.

WEMCO®
WESTERN MACHINERY COMPANY

DEPT. A-2214, 760 FOLSOM STREET • SAN FRANCISCO 7, CALIFORNIA
50 CHURCH STREET • NEW YORK, NEW YORK
129 ADELAIDE STREET WEST • TORONTO, CANADA
20 BOULEVARD MALESHERBES • PARIS (8e), FRANCE
Representatives in principal cities of the United States and Canada and in major countries throughout the world.

Washington *(Continued)*

1,031 ft in 1954. The project, undertaken with Government help, is to develop from below a surface showing of copper combined with small amounts of nickel. Total length will eventually be 4,000 ft.

Report from Wellpinit says Federal officials have not approved leases for uranium prospecting on the Spokane Indian Reservation except to Midnite Mines, Inc. (See *E&MJ*, April 1955, p 122)

A suit to obtain a one-third interest in the Midnite uranium mine on the Spokane Indian Reservation was filed in superior court in Spokane, in March, by Leo J. Bruce. An order was obtained by his attorneys from Judge Carl C. Quackenbush temporarily restraining John LeBret and James LeBret and Midnite Mines, Inc., from selling or disposing of the mine. LeBrets and the mine firm must show cause why they should not be restrained pending trial of the suit. Bruce asks a one-third interest and an accounting of ore sold to date. He claims to have been with the LeBrets prospecting in the spring of 1954. LeBrets, he says, located a claim and obtained prospecting permits from the Spokane Indian Council for themselves but not for him.

Daybreak Uranium, Inc., which has been organized to develop the uranium discovery on the Dahl farm, near Elk, in Spokane County, is capitalized for 3-million shares at 10c par. James W. Fox, president, Greenacres, reported that Evergreen Uranium, Inc., had been formed as the first operating company but the Dahls requested the change because they had named their discovery the Daybreak mine. Atomic Energy Commission plans an exploratory diamond drilling program at the Daybreak property when it completes its program at the Midnite property, H. W. Norman, project chief of the Coeur d'Alene, Idaho, office of AEC, announced in March. He said the AEC wishes to get more geologic information concerning the type of mineralization on the Daybreak holdings.

U. & W. Uranium Inc. has filed articles of incorporation at Olympia, listing capitalization at $400,000. Incorporators are Thomas J. Linton, a mining man of Opportunity, Ralph A. Gering, a wheat rancher and oilman of Ritzville, and S. Everett Salter of Spokane. The initials stand for Utah and Washington. The company has bought 1,000 acres near Blanding, in San Juan County of Utah and has leased 63 acres near Elk in Spokane County.

WYOMING

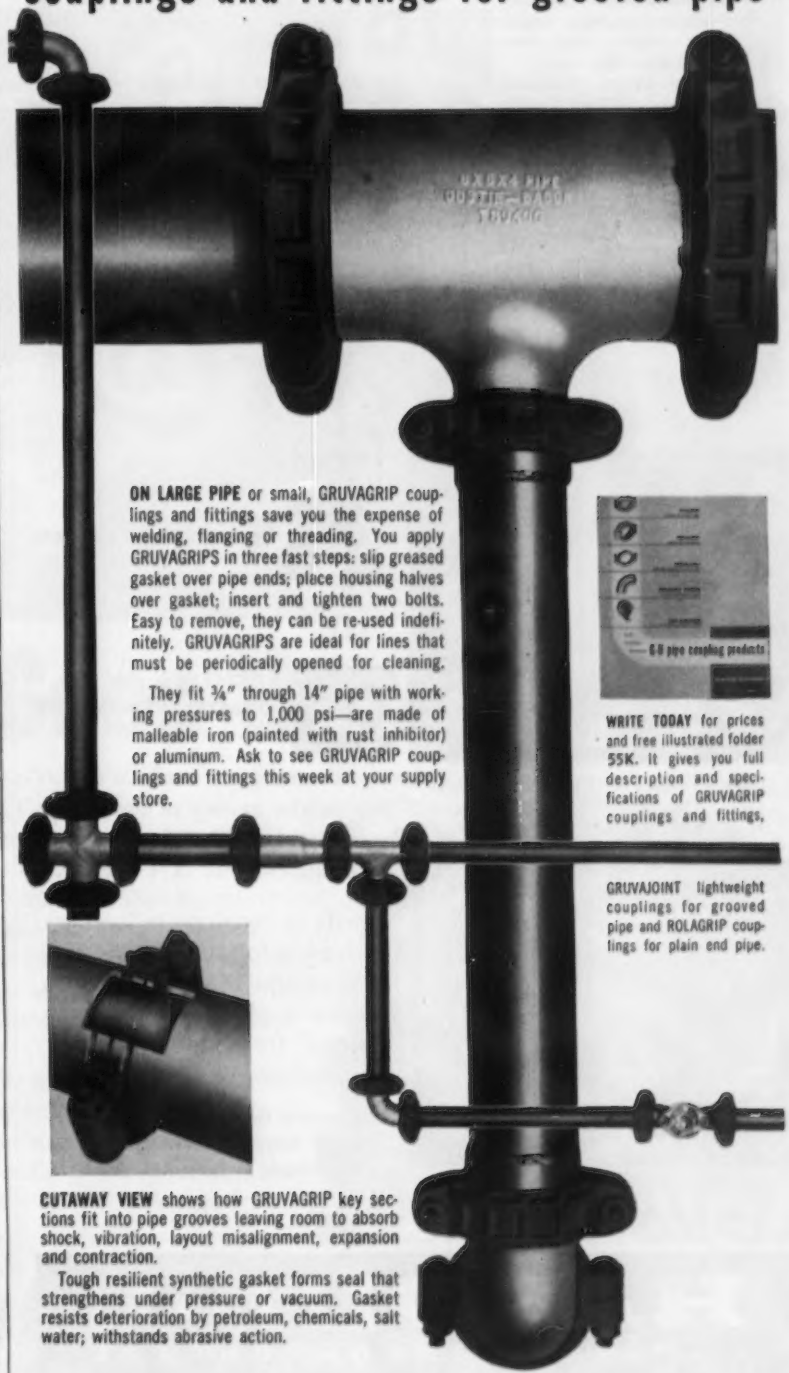
Great Western Aggregates, Inc., subsidiary of the Ideal Cement Co. of Denver, is making an intensive search for uranium in the Laramie area.

R. F. Blanks, general manager, said a reconnaissance crew would seek promising territory in a 150-200 mile radius of Laramie, and that "our geologists are very optimistic."

Great Western hopes to convert part of its alumina plant at Laramie to ura-

GRUVAGRIP

couplings and fittings for grooved pipe



ON LARGE PIPE or small, GRUVAGRIP couplings and fittings save you the expense of welding, flanging or threading. You apply GRUVAGRIPS in three fast steps: slip greased gasket over pipe ends; place housing halves over gasket; insert and tighten two bolts. Easy to remove, they can be re-used indefinitely. GRUVAGRIPS are ideal for lines that must be periodically opened for cleaning.

They fit ¾" through 14" pipe with working pressures to 1,000 psi—are made of malleable iron (painted with rust inhibitor) or aluminum. Ask to see GRUVAGRIP couplings and fittings this week at your supply store.

WRITE TODAY for prices and free illustrated folder 55K. It gives you full description and specifications of GRUVAGRIP couplings and fittings.

GRUVAJOINT lightweight couplings for grooved pipe and **ROLAGRIP** couplings for plain end pipe.

CUTAWAY VIEW shows how GRUVAGRIP key sections fit into pipe grooves leaving room to absorb shock, vibration, layout misalignment, expansion and contraction.

Tough resilient synthetic gasket forms seal that strengthens under pressure or vacuum. Gasket resists deterioration by petroleum, chemicals, salt water; withstands abrasive action.

Gustin-Bacon Manufacturing Company

210 West Tenth Street — Kansas City 6, Missouri

Wyoming *(Continued)*

nium processing, if AEC approval can be obtained. Ideal Cement purchased the plant, built during World War II by the Government, for $1.2-million.

Homestake Mining Co. confirms acquisition of 66 mining claims through option in the Natrona County section of the Gas Hills uranium district.

Fifty-five claims were acquired from the Wyute Mining and Development Corp., Salt Lake City.

In addition to the 55 claims, Homestake obtained option on 10 other claims adjoining. Homestake will pay the owners a 12½% royalty if production is discovered. The property acquisitions mark first entrance of Homestake into the Gas Hills district.

Timco Uranium, Inc. will merge with De Pas Uranium Co., thereby obtaining claims in Fremont County, says L. D. Gardner, Timco president. Claims are near the Little Missouri, Inc. and the Allard-Kaiser operation of Kerr-McGee Oil Industries' Navajo Uranium Division.

More than 100 claims have been staked in the last 18 months in Big Horn Basin; 100 in Washakie County, nearly 100 in Park County and "a handful" in little Hot Springs County.

Production from Lucky Mc Uranium Corp. properties in the Gas Hills of Fremont County is to be stepped up from 35 to 100 tons daily.

W. H. H. Cranmer, president of the company, said "we could produce considerably more than 100 tons a day, but the buying station at Riverton is pretty small."

Possibility of constructing a mill at Riverton reportedly is being discussed by a number of companies, including Lucky Mc, Standard Ore and Alloys, Homestake Mining Co., Knapp Engineering Co., Vitro Corp. of America, Climax Uranium Co. and Foley Brothers Construction Co.

L. C. Garnick, manager of the Trail Creek Mining Co. of Douglas, reports three veins of pitchblende have been uncovered in a 355-ft tunnel on their properties.

W. T. Nightingale, president of the Mountain Fuel Supply Co., confirmed his company has taken an option on 100 uranium claims in the Lost Creek area of Sweetwater County.

New price record for Wyoming was established when Mountain Mesa Uranium Corp. paid $10,000 to two part-time Lander prospectors for a single claim. Claim, called the Evro, was sold by Harold Evans and his partner, who said preliminary work had shown an ore deposit 70 ft long and several feet wide.

Forty claims in the Gas Hills district have been leased by Double O Timber & Mining Co., San Francisco. Firm also holds an option to purchase, according to Albert Simrak, general manager.

A surface mining operation is planned under the direction of E. B. Smith, general superintendent. A power shovel will be worked around the clock, aiming for production goal of 1,000 tpd.

Simrak said test samples averaged about 0.30% uranium.

IN CANADA

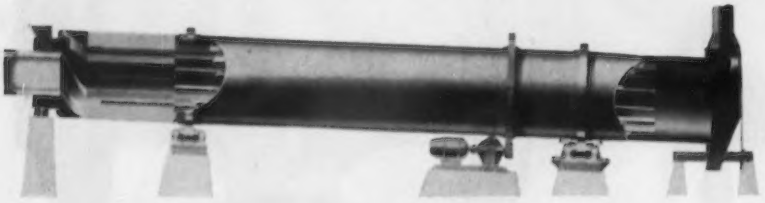
ALBERTA

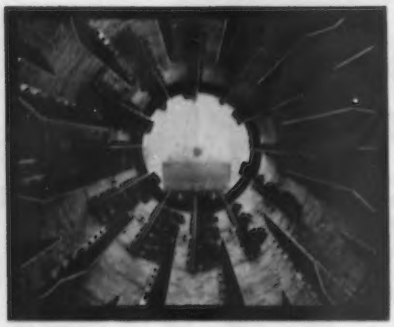
Search for iron ore now is being concentrated in the southwest corner of the province rather than in the Peace River territory, where reports have shown that even though up to 1-billion tons are to be found, grade of the ore may prove to be too low.

Shift of location was disclosed with issuance of the province's fifth iron prospecting permit, this latest one for survey work on 38,268 acres of land surrounding Waterton Park. It was issued to West Canadian Collieries Ltd. of Blairmore.

Four previous permits were issued for searches in the Peace River district.

Uranium may yet prove of economic importance in the northeast corner of Alberta.





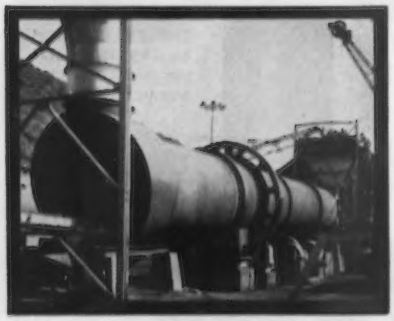
from Alumina ores to Zircon concentrates

Interior of shell of "XH" Ruggles-Coles Dryer showing lifting flights and "knock-out" chains.

... in the drying of ores and concentrates. That is the story of Ruggles-Coles "XH" Dryers.

Small or large, each dryer is designed for the specific requirements of the user with the knowledge and experience gained from hundreds of installations.

Complete specifications upon request. Ruggles-Coles Dryers are described in Bulletin AH-438-1



10′ diameter, 80′ long "XH" Ruggles-Coles Dryer drying bauxite.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

United States Rubber Company 4-year project pays off—
mine operators report they're well ahead with U. S. Royal!

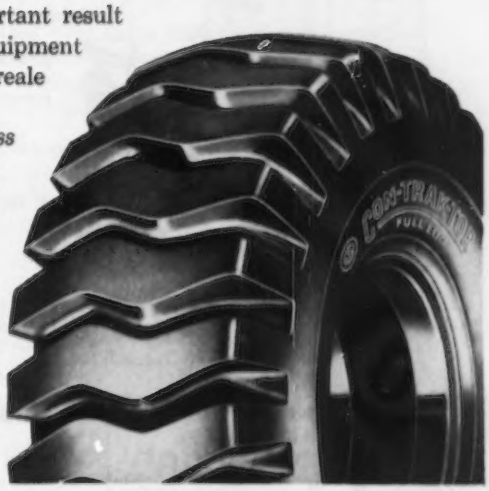
"Practically eliminated our downtime"
says P. Correale, Correale Construction, Hazleton, Pa.
"There's no tougher test for tires than anthracite coal stripping. Tire failure here can knock out a truck for a 7-hour shift—*for a $400 loss.* But U. S. Royal Con-Trak-Tors have practically *eliminated* our downtime."

Down Goes Downtime!

The new U. S. Royal Con-Trak-Tor—Full Lug, an important result of U. S. Royal's 4-Year Truck Tire Project, is cutting equipment downtime 'way down for leading mine operators like Correale Construction Co.

Good reasons, too! The Con-Trak-Tor's *Nylon cord carcass* stands up to vicious shocks, shrugs off rocks and snags. It has *triple impact protection*—extra rubber between plies, double shock-pads under the tread, extra-tough construction at the crown. Its *full lug traction* pulls right through toughest going, just *won't* bog down!

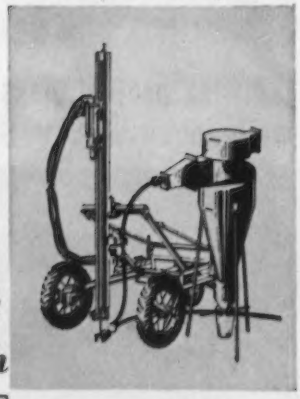
Why not let the Con-Trak-Tor prove it can reduce *your* downtime, lower *your* operating costs? Your U. S. Royal Dealer has this great tire in your size. Have him put it on your wheels—and prove to yourself why mine operators like Correale Construction Co. report they're *well ahead* with U. S. Royal!



U.S. ROYAL NYLON CON-TRAK-TOR FULL LUG

ASK YOUR U. S. ROYAL DISTRIBUTOR TO SHOW YOU THE NEW FILM ON BETTER HIGHWAYS: "MEMO TO MARS"

Ducon Sampler as used with portable wagon drill.



discover

AND CONTROL

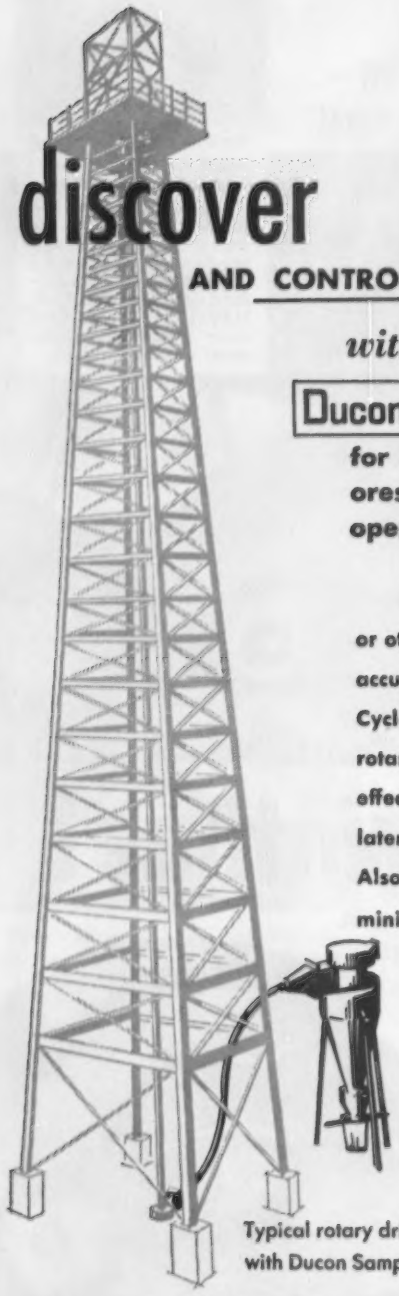
with

Ducon SAMPLERS

for Uranium, other precious ores and general drilling operations

If you're prospecting for uranium or other valuable ores, discover more accurate samplings with the Ducon Cyclone. It is easily mounted on rotary and wagon drill units and effectively collects drill cuttings for later evaluation of penetrated ores. Also, for general drilling and related mining operations, Ducon Cyclones provide a simple and effective means for dust control.

Write today for Bulletin



Typical rotary drill installation with Ducon Sampler.

the name in dust control

THE Ducon COMPANY

Canadian Branch: THE DUCON COMPANY of CANADA, Ltd. 275 James Street North, HAMILTON, ONTARIO

147 EAST SECOND STREET, MINEOLA, N.Y. • Sales Representatives in Principal Cities

Designers and Manufacturers of Dust Control Equipment Exclusively

CYCLONES • CENTRIFUGAL WASH COLLECTORS • TUBULAR CLOTH FILTERS • DUST VALVES

Alberta *(Continued)*

Government points out that the area, where the Precambrian Shield reaches west and south into Alberta from Saskatchewan and Northwest Territories, has the desirable geological structure for uranium occurrences.

BRITISH COLUMBIA

Consolidated Mining and Smelting Co. is to resume production soon at its lead-zinc HB Mine, near Salmo.

Preparations for resuming production were to be made in April and 150 men will be employed.

When base metals prices were low in spring of 1953, Cominco halted a $2,750,000 development operation to prepare the mine for production. A 4,000-ft tunnel to sulphide orebody was dug and a 1,000-ton concentrator was built. Company's diamond drilling program had developed a large tonnage of sulphide ore.

Since completion of the program, stockpiles of base metals which led up to the decline in the market in 1953 have dwindled, thus strengthening demand again, especially for lead.

Another lead-silver-zinc producer, Silver Standard at Hazelton, also was reported preparing to resume production after lay-off of several months.

European mining interests which have already poured about $41-million into development in Eastern Canada, are entering the field in British Columbia this year.

Representatives of Rio Tinto Co., London, and Sogemines Ltd. of Belgium, operating in this country as Rio Canadian Exploration Co., are in Vancouver making plans to launch a major exploration program this summer.

Rio Tinto has marked itself as a leading contender in race for control in fast-developing uranium field, and it first made big news in British Columbia when it bought into the rich Algom property of Blind River.

First step will be hiring of prospectors and geologists, report J. K. Booth and J. R. Vail of Rio Canadian. Primarily Rio Canadian is interested in uranium, but will be after other minerals too.

Cominco mines at Yellowknife, N. W. T., and Tulsequar, B. C., are winners of John T. Ryan regional safety trophies for 1954. Consolidated Mining and Smelting Co. has been informed of the awards by the Canadian Institute of Mining and Metallurgy, organizers of the competition. Awards are sponsored by the Mine Safety Appliances Company of Canada Limited.

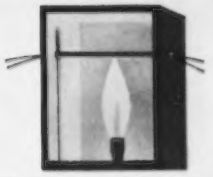
MANITOBA

Hudson Bay Mining & Smelting Co. Ltd. estimates ore reserves at Jan. 1, 1955 at 17,310,000 tons, averaging 0.074 oz gold, 0.98 oz silver, 3.22% copper, and 3.7% zinc. Ore mined and hoisted at the Flin Flon mine during 1954 was 1,524,441

GENERAL CABLE

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

resists all hazards far beyond accepted field requirements



SUPER SERVICE

Heavy Duty Mold-Cured Portable Cords and Cables

Constant research . . . both in our laboratories and in the field . . . keeps SUPER SERVICE ahead of your most severe applications.

Result: longer cable life, fewer work stoppages, and improved safety!

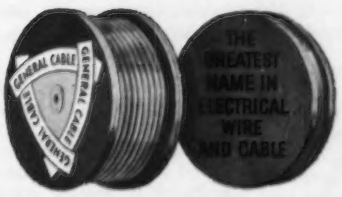
For example, the SUPERTUF neoprene jacket on new SUPER SERVICE resists sleeving, crushing, tearing, abrasion, oil and flame . . . specially reinforced for extra tensile strength.

New THERMAX heat-resistant insulation gives top protection against temporary current overloads.

Combined with extra features such as compact design to reduce sleeving of jacket from core . . . it's no wonder that SUPER SERVICE has become a byword for dependability.

In mining operations everywhere . . . day after day . . . SUPER SERVICE is keeping in check all the costliest hazards. Why settle for less? See your friendly General Cable Representative today!

GENERAL CABLE
CORPORATION



BARE, WEATHERPROOF, INSULATED WIRES and CABLES FOR EVERY ELECTRICAL PURPOSE

GENERAL CABLE CORPORATION
Executive Offices: 420 Lexington Ave., New York 17, N. Y.

SALES OFFICES: Atlanta • Baltimore • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit Erie (Pa.) • Greensboro (N. C.) • Houston • Indianapolis Kansas City • Lincoln (Neb.) • Los Angeles • Memphis Milwaukee • Minneapolis • New Haven • Newark (N. J.) New York • Philadelphia • Pittsburgh • Portland (Ore.) Richmond (Va.) • Rochester (N. Y.) • Rome (N. Y.) St. Louis • San Francisco • Seattle • Springfield (Ill.) Syracuse • Tampa • Tulsa • Washington, D. C.

WHY
AFCO

"ICDH" GRINDING BALLS
GRIND 6 to 10% LONGER

"ICDH" means Improved Carbon Deep Hardened—and you'll avoid out-of-roundness, spalling, splitting, fast wear, and excessive downtime by using AFCO "ICDH" grinding balls. These balls have a hardness and toughness comparable with costly alloy balls. Here's why:

They are forged from steel produced to exacting chemical specifications, in our own hearths; consequently, we can test each ingot before rolling.

In addition, the right steel for each ball size is determined by hardenability testing. Automatic upset forging assures proper grain flow and produces the roundness needed for long, uniform wear.

After forging, AFCO grinding media receive carefully controlled heat treatment to produce maximum hardness and penetration consistent with toughness.

RESULT: AFCO "ICDH" balls give you performance comparable with alloy balls—yet they cost no more than ordinary carbon balls. Sizes: ¾" to 5". Phone, write or wire NOW for quotations.

AMERICAN FORGE CO.

Executive offices and plant: Niles, California
Phone Niles 3311
Sales offices: 101 Park Ave., New York City; Portland, Oregon; Los Angeles, Calif.; Salt Lake City, Utah

"AFCO" PRODUCTS

10

Blue phosphate ore, assaying 65 to 70%, is removed from strip mine at Maury and Hickman county line in Tennessee, by Bucyrus-Erie shovel and International Drott TD-18A Skid-shovel. Herschell Patterson, mining contractor, Centerville, says ore color differs from yellow, usually found in the area and is richer.

Manitoba *(Continued)*

tons. Net profits increased by approximately $1.4 million to $12,864,124 from $11,456,023.

Company's Schist Lake mine, 3.5 miles from Flin Flon, was put into production during August 1954, the ore being trucked to Flin Flon for treatment. North Star Mine, 24 miles east of Flin Flon, is being readied for production during 1955. Development work is continuing at the Birch Lake Mine and Coronation Mine, in Saskatchewan.

An active exploration program is planned for areas in Northern Manitoba, and also the Yukon Territory, where underground work is being carried out on the Wellgreen nickel property.

Howe Sound Exploration Co. at Snow Lake reports ore reserves have been maintained during 1954. Production continued at a rate of 1,400 tpd throughout the year. Shaft has been sunk to 1965 ft, with work preliminary to driving new levels being well advanced at year end.

North Country Uranium & Mineral Ltd. reports that a geological survey has started on its 18 claim lithium prospect in the Winnipeg River area of southeastern Manitoba.

Forty-Four Mines Limited, controlled by San Antonio Gold Mines Ltd., officially came into production as a new gold producer on Jan. 1, 1955. Output of 250 tpd is planned, the ore being treated in the San Antonio mill.

San Antonio Gold Mines Ltd. is currently investigating pegmatite zones in the Rice Lake area where preliminary surveys have shown some promising indications of radioactivity. Company is also carrying out deep drilling on an uranium prospect in the Blind River area of Ontario.

Sherritt Gordon Mines Ltd. reports production of 6,214,000 lb of high quality nickel metal to the end of 1954. Operations at the Fort Saskatchewan refinery started in July 1954. Mine and concentrator at Lynn Lake have been producing more than 2,000 tpd of ore. Plans called for International Nickel Co. to produce 10-million lb of nickel from Sherritt's concentrates to be made available to the U. S. Government stockpiling agency by April 1955. Nickel production in concentrates averaged over 2-million lb per month at the end of 1954.

ONTARIO

Dome mines, Canada's fourth largest gold producer, has sold certain interests, including its holdings in Blyvoors and Grootvici, to acquire shares in Miami Copper, a producer in Arizona. Dome has acquired 45,886 shares of 743,216 shares outstanding in Miami, which has estimated copper ore reserves of 60.6-million tons.

Quebec Metallurgical Industries, a subsidiary of the Frobisher and Ventures organization, has arranged $5-million worth of financing.

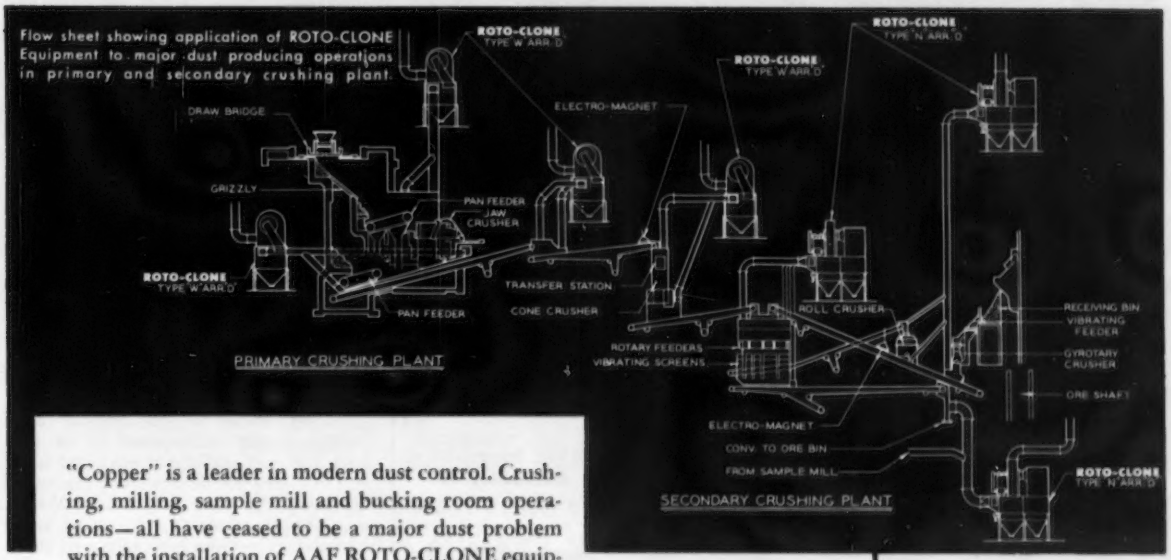
Quebec Metallurgical is handling the Frobisher-Ventures investigation of a possible power development, electrochemical and metallurgical project in northern British Columbia and the Yukon territory. Company recently acquired Cobalt Chemicals, which has a refinery at Cobalt, Ontario.

Copper Jim Mines is drilling on its copper-gold-silver prospect in the O'Sullivan Lake area, 30 miles northeast of Tashota. Surface work last fall disclosed a large area of mineralization, and a 10,000-ft drilling contract has been arranged to probe it.

Iron ore production has started at the property of Bethlehem Mines Corp.,

Take a Tip from the Copper Companies

ROTO-CLONE Dust Control Betters Industrial Relations — Reduces Labor Turnover

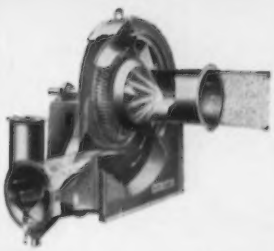


"Copper" is a leader in modern dust control. Crushing, milling, sample mill and bucking room operations—all have ceased to be a major dust problem with the installation of AAF ROTO-CLONE equipment.

Note the flow sheet above. This primary and secondary crushing plant has a capacity of 900 tons per hour—operates two 8-hour shifts. Dust from all major dust sources is exhausted and collected by four Type W and three Type N ROTO-CLONES. Result—employees enjoy the best of working conditions and nearby homes and hospital are free of any dust nuisance.

ROTO-CLONE was the logical selection for this service because these "wet collectors" (1) assure highest efficiency in the collection of fine dust particles; (2) eliminate abrasion and (3) permit disposal of the collected material as a sludge to prevent a secondary dust problem.

So, we repeat—"Take a tip from the copper companies!" Investigate the many benefits ROTO-CLONE Dust Control can bring to your operations, whether large or small. For complete ROTO-CLONE information, call your local AAF representative or write direct.



Type W ROTO-CLONE—a dynamic precipitator which, by the addition of a moving water film on the collecting surfaces, extends its high cleaning efficiency to the collection of the lightest, finest dust particles.

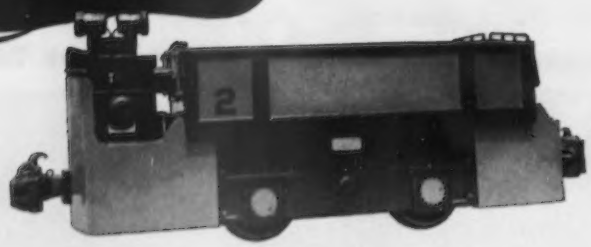
Type N ROTO-CLONE—a hydro-static precipitator which obtains its high cleaning efficiency from the scrubbing and centrifugal action in the impellers—and thorough intermixing of water and dust-laden air. Water recirculation is obtained without pumps or other moving parts.

American Air Filter
COMPANY, INC.
193 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

AAF

GREENSBURG EIGHT TON MONITOR
Storage Battery Locomotives

...for top performance "Double Equalizers" make the difference



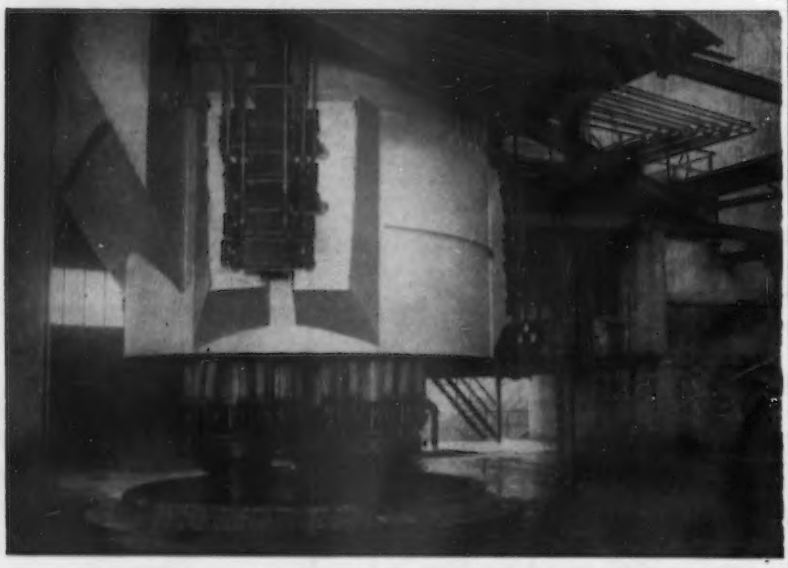
The Greensburg 8 ton Monitor is equipped with two glass insulated motors, contactor type controller and double equalizers. These double equalizers make the difference in performance . . . more tractive effort, better brakes, better riding qualities and longer battery life than any other storage battery locomotive of equal weight and battery capacity!

All Greensburg locomotives are Custom-Built to meet your requirements in both single and double motor drive with drum, cam or contactor type controllers.

For more earning power per invested dollar specify Greensburg Storage Battery Locomotives.

GREENSBURG MACHINE CO.

102 Stanton St.
Greensburg, Pa.



Elkem

ELECTRIC SMELTING FURNACES
The Soderberg Electrode System
Metallurgical plant design and erection

ELEKTROKEMISK A.S.

WRITE FOR CATALOG
101 PARK AVENUE, NEW YORK 17, NEW YORK
(HEAD OFFICE: OSLO, NORWAY)

Ontario *(Continued)*

Bethlehem Steel subsidiary, near Marmora. Under development since 1951, the big open pit and concentrator are geared for production of 500,000 tons of iron pellets annually. Mine's magnetite ore, averaging 37.5% iron, is upgraded by sintering to average 65%.

Possibility of a new iron ore source is seen in Clay and Howells Twps., 30 miles north of Kapuskasing. On two claim groups covering two magnetic anomalies, initial drilling has indicated good grade of concentrating magnetite to at least 700 ft, and preliminary tests show no metallurgical difficulties. A comprehensive drilling test is now being started.

Hercules Uranium Mines is engaged in surface exploration of two properties in the Bancroft area, both in Monmouth Twp. A scintillation counter survey is being run on each group.

In Bancroft, Canada Radium Corp. has started drilling. Magnetometer and scintillation counter surveys disclosed 12 radioactive zones with aggregate length exceeding 5,000 ft.

Expanded program of underground development is being started by Faraday Uranium Mines to test vertical continuity of the ore opened in its two adits. Overall estimate of ore in the adits is 1.078 tons per vertical foot averaging 0.21% U_3O_8; total length is 1,034 ft and average width 11.5 ft. Next steps include raising from both adits, and sinking a 150-ft shaft from the west adit. Property is one of the most advanced prospects in the Bancroft area.

Blind River uranium area continues to develop as one of Canada's most important new mining areas. Three mills are under construction: Pronto Uranium's, with capacity to be 1,800 tpd; and Algom Uranium's two with 3,000-ton capacity. The two companies have contracts with Eldorado Mining & Refining Ltd., government purchasing agent, for sale of $261-million worth of uranium oxide concentrates.

Both Algom and Pronto are in the underground development stage, with large tonnages of ore indicated by drilling. Among the other promising, though less advanced, prospects are: Consolidated Denison Mines, with very large tonnage suggested by widely spaced drilling, and now starting a five-compartment exploratory shaft; Buckles Uranium Mines, with 500,000 tons indicated, average grade 0.124 U_3O_8; Pardee Amalgamated Mines, still drilling to extend the 1.5-million tons indicated to date with average grade 0.07% U_3O_8; Pater Uranium, with 328,000 tons averaging 1.53% copper and 0.11% cobalt; and Lake Nordic Uranium, Can-Met Explorations Ltd., and Spanish-American Mines, all with good potential suggested by first drilling results.

Altogether, more than 20-million tons of probable ore can be estimated for the camp, and the tonnage is growing steadily. More than 50 drills are at work

You Get Your Round in Faster

...and lower your drilling costs with a CLEVELAND Air Leg and Drill Combination

Cleveland Air Legs and Drills have these important essentials — easier handling, higher drilling speed, and sturdy dependability — that enable your miners to increase the footage they can drill per man-shift.

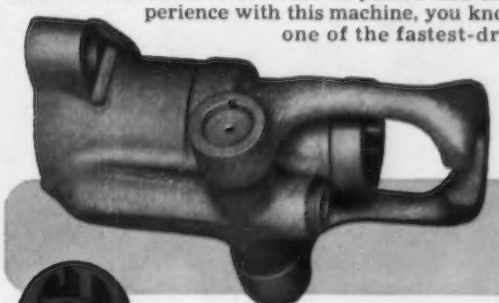
Here's why Cleveland Air Legs and Drills are easier to handle — Only Cleveland gives you an air leg and drill with a built-in 11-position feed control. It eliminates a third hose and cumbersome "Y" connections, reducing the weight a miner has to handle. No feed-control bleed valve is required either so that the operator doesn't have to bleed off air continuously to maintain suitable feeding pressure. And a new, quick-opening steel puller makes steel changing easier and faster.

Here's why Cleveland Air Legs and Drills have higher drilling speed — First of all, the Cleveland Air Leg uses the Cleveland H-10 drill. If you've had any experience with this machine, you know it's one of the fastest-drilling sinker drills made today. Then you have the built-in feed control that provides 11 feeding positions from zero to full-line pressure — with an increase of 9 psi at each setting. It lets the operator adjust the feed so that the drill is always down on the collar of the shank for maximum drilling speed, regardless of varying rock conditions.

Here's why Cleveland Air Legs and Drills stay underground longer — The Cleveland H10 drill is a proved performer, not only in the matter of drilling speed but also in upkeep cost. It's built to take it. And the Cleveland Air Leg holds the drill in line with the hole — thus reducing front-end drill wear and practically eliminating rotation strains. Moreover, the new steel puller helps to reduce maintenance costs still further. It consists of only five parts — there's only one spring and one plunger, and it's lubricated from the inside to prevent wear and to wash out dirt.

Four types available — There are four types of Cleveland Air Legs having conventional or telescopic, 3-ft., 4-ft., or 5-ft. feeds. Some models will take any 35-lb., 45-lb., or 55-lb. drill. Write for bulletin RD-30 that describes the Cleveland Air Leg in detail—the Air Leg that can help you get your rounds in faster for lower costs.

RD-65



Close-up view of new Cleveland Steel Puller. It consists of only 5 parts and has one spring and one plunger. Lubricated from the inside to assure easy operation and to flush out dirt, this new steel puller is also easy to assemble and disassemble.

CLEVELAND ROCK DRILL DIVISION
Westinghouse Air Brake Co.

12500 BEREA ROAD
CLEVELAND 11, OHIO

HARBISON-WALKER
AND SUBSIDIARIES

Harbison-Walker

COPPER SMELTER REFRACTORIES

extend furnace life...
increase production...
reduce operating costs...

A single basic refractory having universal application in metallurgical furnaces can only be visionary. The selection and use of the refractory best suited for each specific requirement is reality—upon which depends the most desirable results. Harbison-Walker produces no less than 12 different classes of basic brick, and in addition various basic monolithic materials and cements. These provide the particular kinds that serve best for every individual need.

Included in this complete range of commercial basic refractories are CHROMEX B, the extra hard fired chrome-magnesite brick, and H-W MAGNESITE brand, a superior high magnesia content brick having also enhanced physical properties. These continue to make splendid records in copper converters.

Cross-section of typical copper converter, showing refractory lining.

Please consult Harbison-Walker technical service.

REFRACTORIES COMPANY

World's Largest Producer of Refractories • General Offices: Pittsburgh 22, Pennsylvania

Ontario *(Continued)*

in the area, which covers some 1200 sq miles of territory, and active companies can be listed by the dozen. First producer in the field will be Pronto, scheduled to have its mill completed in the early fall of this year.

QUEBEC

Dun Raven Mines is diamond drilling a large disseminated graphite deposit in Thorne and Clarendon Twps., 10 miles north of Shawville. Preliminary work shows that the deposit runs to millions of tons, and the continued program is designed to test for average grade, while investigation is also being made into possible markets. If successful, the project will be open pit.

Last days are looming for Powell Rouyn Gold Mines, 17-year gold producer of the Noranda area. Ore shipments, which have been made to the Noranda smelter, will be discontinued this summer; and the company's own 500-ton mill, used for years only as a custom plant, will be sold. The company will not go out of business. With some $800,000 in net current assets, it is already looking for new properties.

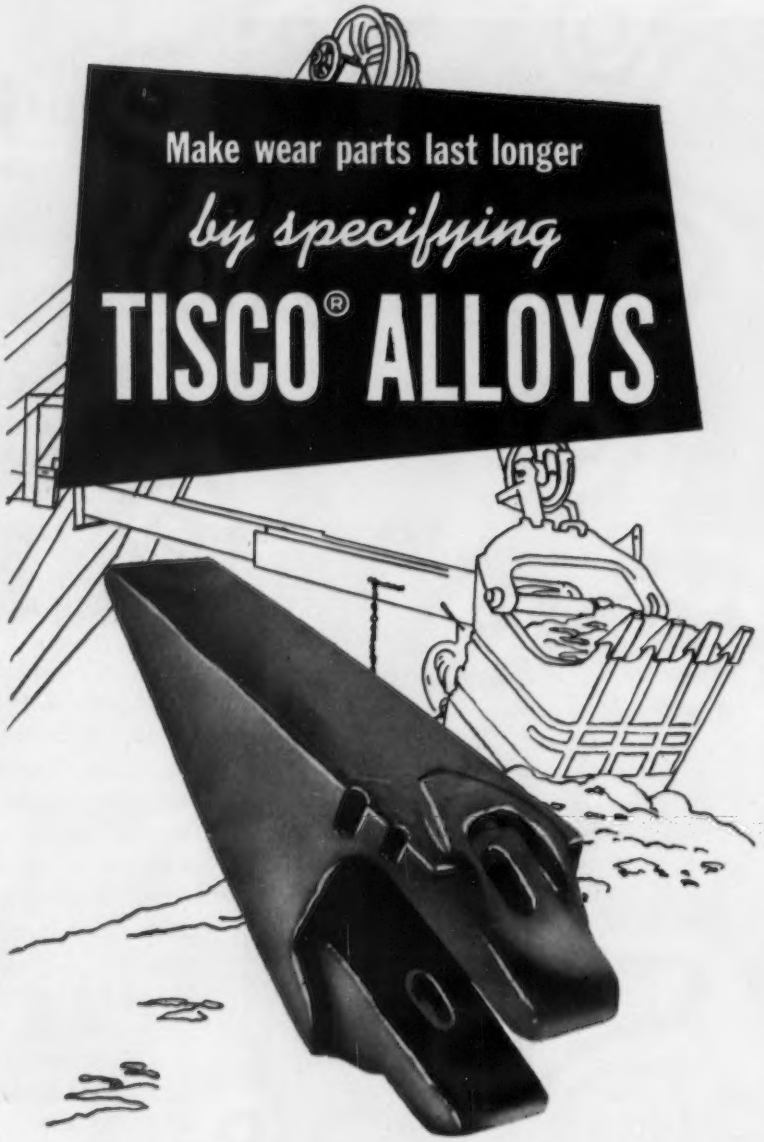
Eastern Metals Corp. estimates proven and probable ore in its nickel zone, the property's main showing, at 317,000 tons containing 6.6-million lb of nickel, practically all above the 3 level. Work is now well started on the opening of the 5 level (705-ft horizon), the shaft having been deepened last winter from 500 ft. Property is in Montmagny Co., 65 miles southeast of Quebec City.

Diamond drilling is planned by Cardinal Uranium & Copper Mines on a 400-acre copper prospect in the Noranda area, where two mineralized zones showing copper values have been disclosed in surface work. Later in the year the company plans also to do exploratory work on its copper prospect in Chibougamau, and on a 1,000-acre lithium prospect in Senneville Twp.

Another newcomer to the lithium search is Lyndhurst Mining Co., with a group of 50 claims in LaMotte Twp. Good indications of spodumene were had in 13 pits, and diamond drilling plans are being formulated.

At least 25-million tons of ore has been indicated in drilling to date on the property of Molybdenum Corp. of America in the Oka district near Montreal. Ore contains columbium, tantalum, iron, phosphorus, and some thorium, as well as mica. While little publicity has been made available on the project, it is known that milling plans are being formulated. It is expected that two years and $3 to $4-million will be required to bring the property to production.

Headway-Coulee property, also in the Oka district, is making good exploration progress. Drilling to date suggests 10-



For almost seven decades Taylor-Wharton has specialized in research, development and production of wear-resistant alloys. Tisco Manganese Steel has become widely known in the mining and stone products industries for wear parts of power shovels, jaw crushers and other heavy duty equipment subjected to wear in a combination of impact and abrasion. It is still unsurpassed under such conditions.

More recently, too, Taylor-Wharton has developed other alloys for special purposes. Among these is Tisco 150-Y, a high chrome cast iron, capable of heat treatment up to 700 Brinell with strong resistance to severe abrasion, where impact is not a factor. Another useful alloy is Tisco 23-Y, a medium manganese chrome molybdenum alloy that can be hardened by heat treatment to 300-500 Brinell. It has excellent abrasion resistance with fair impact qualities.

These and other Tisco Alloys are at your service to lower maintenance costs. Ask us about them.

TAYLOR-WHARTON Iron & Steel Co.

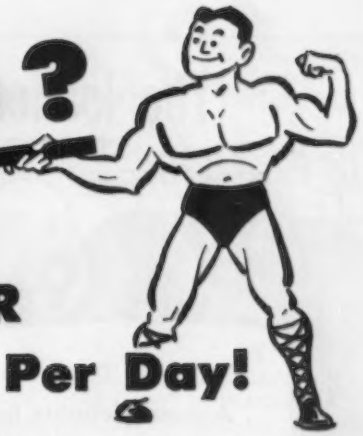
(Division of Harrisburg Steel Corporation)

HIGH BRIDGE 1, NEW JERSEY

Use TIMANG Weld Rods and Shapes for rebuilding and repairing worn parts made of manganese steel.

Birmingham, Ala. Cincinnati, O. Easton, Pa.

RUGGED?



10 hp CARRIER CONVEYOR Moves 84,000 Foot-Tons Per Day!

THERE'S almost no limit to how rugged a Carrier Natural-Frequency Conveyor can get. Nor to what "impossible" jobs it can do. That's because Carrier Conveyors operate according to the laws of Natural Frequency and the application of this scientific principle was pioneered exclusively by Carrier.

NATURAL FREQUENCY: Carrier Natural-Frequency Conveyors substitute the natural resonant action of springs for brute force — thus UTILIZING the tremendous force of periodic vibration which, before Carrier, was considered a liability. Most of the power needed to operate Carrier Natural-Frequency Conveyors is repeatedly stored up in the springs, and returned on every stroke. The result — *much less power required . . . far less maintenance . . . far less down-time!*

Carrier Natural-Frequency Conveyors are now delivering incomparably efficient, trouble-free performance for many of America's biggest industrials. Mail the coupon, *today*, for all the facts.

150 Tons Per Hour Of Foundry Sand Handled With 10 hp!

Handling up to 150 tons per hour of foundry sand — including occasional sprues and tramp iron — is a rough, tough job. But it's a *cinch* for this 70-foot Carrier Natural-Frequency Conveyor! This big Heavy-Duty unit has a ⅜" steel-plate pan, 36" wide, and is powered by one 10 hp drive. Vibrated weight is approximately three tons. More than 50 giant coil springs are used. Full details gladly sent on request.

CARRIER ADVANTAGES

HIGH CONVEYING SPEED
(Up to 100 feet per minute)

GREATER CAPACITY
(Up to 200 tons per hour)

LESS POWER REQUIRED
(About one-third as much as "competitive" equipment)

LESS MAINTENANCE & DOWN-TIME
(Less power + good design = trouble-free performance)

NO DAMPENING UNDER LOAD
(Designed with extra power for specified load, with positive stroke)

SELF-CLEANING
(Continuous, smooth trough — no pockets)

COMBINES PROCESSING WITH CONVEYING
(Can screen, dry, cool, dewater, blend, etc.)

WIDTHS FROM 6" TO 48"—LENGTHS FROM 5' TO 250'
(With pans 16 ga to ½" plate, of any metal, open or enclosed)

BALANCED, VIBRATION-FREE UNITS AVAILABLE
(For use on ceilings or light floor construction)

CARRIER
~~NATURAL-FREQUENCY~~ CONVEYORS

Carrier Conveyor Corporation
215 N. Jackson St., Louisville 6, Kentucky

Gentlemen: Without obligation, please send me Carrier Natural-Frequency Conveyor Bulletin No. 111.

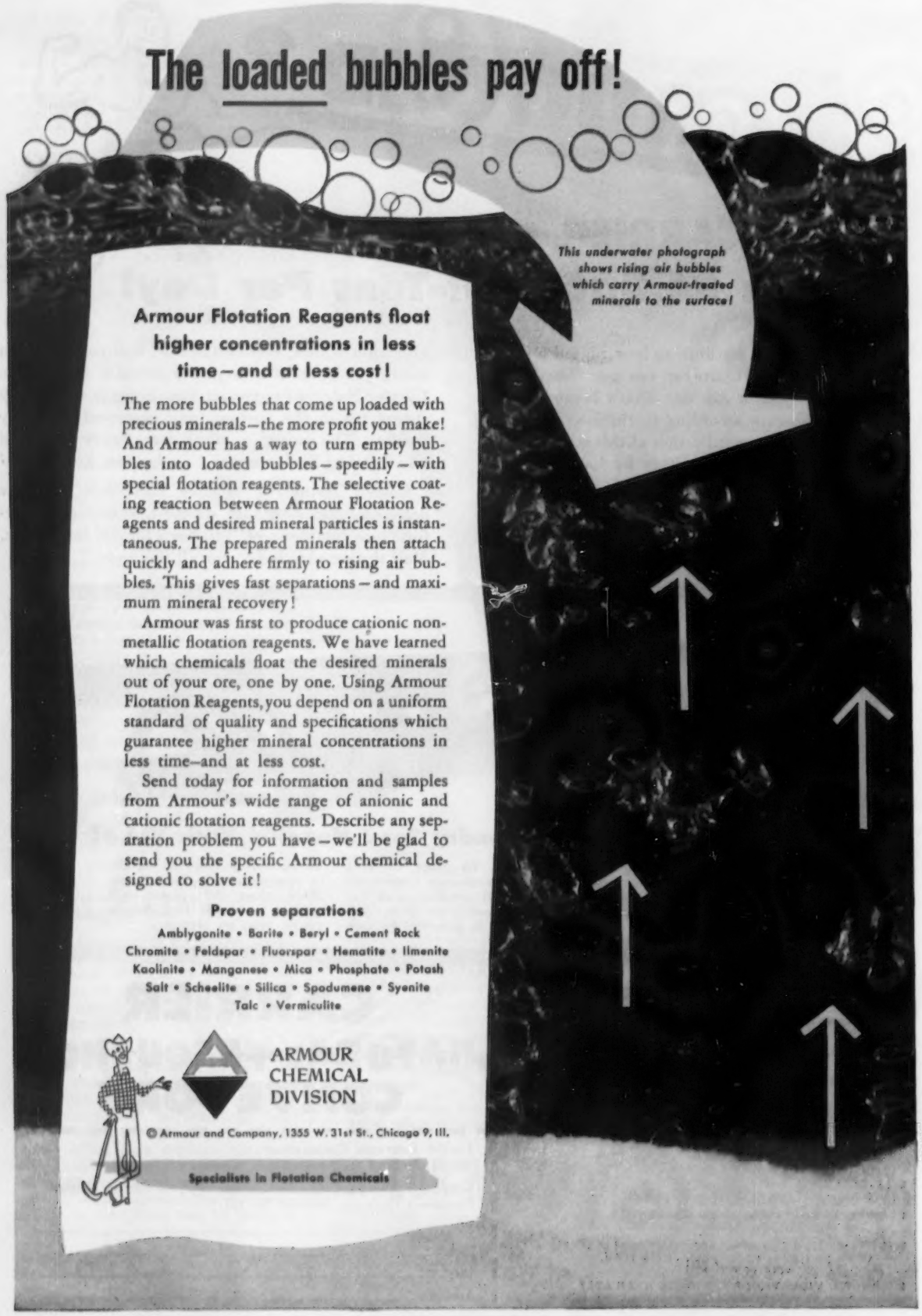
Firm_____

Street_____

City_____ State_____

Att. Mr._____ Dept._____

The loaded bubbles pay off!



This underwater photograph shows rising air bubbles which carry Armour-treated minerals to the surface!

Armour Flotation Reagents float higher concentrations in less time—and at less cost!

The more bubbles that come up loaded with precious minerals—the more profit you make! And Armour has a way to turn empty bubbles into loaded bubbles—speedily—with special flotation reagents. The selective coating reaction between Armour Flotation Reagents and desired mineral particles is instantaneous. The prepared minerals then attach quickly and adhere firmly to rising air bubbles. This gives fast separations—and maximum mineral recovery!

Armour was first to produce cationic nonmetallic flotation reagents. We have learned which chemicals float the desired minerals out of your ore, one by one. Using Armour Flotation Reagents, you depend on a uniform standard of quality and specifications which guarantee higher mineral concentrations in less time—and at less cost.

Send today for information and samples from Armour's wide range of anionic and cationic flotation reagents. Describe any separation problem you have—we'll be glad to send you the specific Armour chemical designed to solve it!

Proven separations

Amblygonite • Barite • Beryl • Cement Rock
Chromite • Feldspar • Fluorspar • Hematite • Ilmenite
Kaolinite • Manganese • Mica • Phosphate • Potash
Salt • Scheelite • Silica • Spodumene • Syenite
Talc • Vermiculite

ARMOUR
CHEMICAL
DIVISION

© Armour and Company, 1355 W. 31st St., Chicago 9, Ill.

Specialists in Flotation Chemicals

Quebec *(Continued)*

million tons to a depth of 500 ft averaging 0.46 columbium oxide (Cb_2O_5). At current market price this would represent a gross value of about $30 per ton. Project is jointly sponsored by Headway Red Lake Gold Mines and Coulee Lead and Zinc Mines.

Diamond drilling is in progress on the uranium-thorium prospect of Calumet Uranium Mines in the Calumet area.

Gaspé Copper Mines, Noranda's big copper subsidiary at Murdochville, Gaspé Peninsula, is starting production. Operations are on limited scale, however, as the operation is using diesel power; availability of hydroelectric power will be delayed until the power cables crossing the St. Lawrence River are repaired this spring. Gaspé concentrator has rated capacity of 6,500 tons daily, but milling rate for the present is scheduled at 2,000 tons.

Iron Ore Company of Canada, which in 1954 shipped 1,781,453 tons from its mines at Schefferville on the Labrador-Quebec boundary, will exceed that tonnage by a wide margin in 1955. Project, including the railway to Seven Islands on the St. Lawrence River, is well ahead of schedule, and by the end of this coming season will have facilities available for the shipping of 10-million tons annually, two years or so ahead of previous calculations.

Also benefiting ahead of schedule will be the two concession companies, Labrador Mining and Exploration Co., and Hollinger North Shore Exploration Co. Under the IOCO set-up these companies, as property vendors (or lessors) receive a royalty of 7% on all ore shipped; in 1954 this worked out to better than $850,000, and for 1955 it will be substantially higher. In addition, however, the two companies will this year start shipping ore on their own accounts, some two years ahead of the date for which this development was originally sited.

NEW BRUNSWICK

Looking forward to production on its big copper-zinc property in the Bathurst-Newcastle area, American Metal Co. will start underground work this summer. Two shafts will be sunk. At the same time a start will be made on mill construction, tentative plans calling for a plant with initial capacity of 1,500 tons daily. Objective date for the start of production is mid-1957.

Most important result of American Metal Co. Ltd.'s exploration and development program during 1954 was discovery of lead-zinc-copper-silver orebodies at Little River according to annual report. Company formed Heath Steele Mines Ltd. (75% owned by American and 25% by International Nickel Co.) to develop property.

Plans are under way to sink two shafts and bring Heath Steele into production by 1957 with 1,500 tpd.

Bring Drilling Costs in Line...

THE SMALL-HOLE ROK-BIT 3-POINT WAY!

Carbide Rok-Bits—chisel or cross types—gauge sizes: 1¼" thru 4½".

Intra-Set Drill Steel—carbide insert—gauge sizes: 1⅛" thru 2¼".

Are high drilling costs shrinking your profits? Cost conscious operators have found relief thru the use of (1) small-hole drilling, (2) airlegs, (3) NON-RIFLING Rok-Bits®. You, too, can double your drilling speeds, lower first-cost on drill rods, save on explosives and air, this 3-point way. For details, write plant nearest you. Remember, we have tools for large, as well as small hole drilling.

ALLOY or carbon drill steel.

Brunner & Lay Products

Brunner & Lay, Inc.
9300 King St.
Franklin Park, Ill.

Brunner & Lay Rock Bit Corp.
2514 East Cumberland St.
Philadelphia 25, Pa.

Brunner & Lay, Incorporated
2425 East 37th St.
Los Angeles 58, Calif.

Brunner & Lay, Inc.
150 Leslie St., Dallas, Texas

Brunner & Lay Rock Bit Corp.
Sweeten Creek Rd., Asheville, N.C.

Brunner & Lay Corp.
660 N. Tillamook St., Portland 12, Ore.

Why Search for

URANIUM

with a Horse and Buggy?

THE New **ROYAL SCINTILLATOR**

★ Is more sensitive than any other Scintillator or Geiger Counter
★ Easily detects *deeply* buried Uranium deposits from ground or air
★ Produces results never before possible
★ Can be used for oil field surveys
★ Made by the manufacturers of the famous "Scintillator"

Dealers Wanted

Contact your nearest dealer or write direct for complete catalog of Geiger Counters, Scintillators and metal locators including the new "Special Scintillator" priced at only $299.50.

PRECISION RADIATION INSTRUMENTS, INC.
2235 EJR So. La Brea Ave., Los Angeles 16, California
Please send Free Catalog.
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

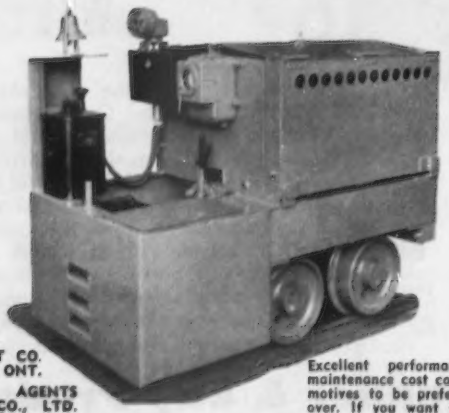
WORLD'S LARGEST MANUFACTURERS OF PORTABLE RADIATION INSTRUMENTS

SINCE 1896

first

FOR

SERVICE and ECONOMY



1½-TON
TYPE J

SOLD IN
CANADA BY

MINE EQUIPMENT CO.
KIRKLAND LAKE, ONT.

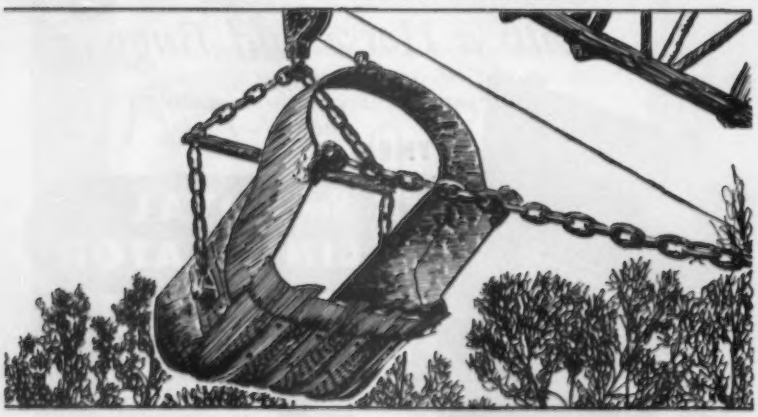
INTERNATIONAL AGENTS
& MACHINERY CO., LTD.
VANCOUVER, B. C.

Excellent performance and low maintenance cost cause these locomotives to be preferred the world over. If you want to reduce your Tramming cost, buy an Atlas.

THE ATLAS CAR & MANUFACTURING CO.

1140 IVANHOE ROAD CLEVELAND 10, OHIO, U. S. A.

RM FOR MEDIUM DIGGING



New medium weight Automatic Dragline Bucket digs sand—loose gravel—dirt. Its new knife-edged lip and teeth cast of high manganese steel; resists shock and wear. More details? Write Dept. "E".

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE • CHICAGO 38

Page
AUTOMATIC
DRAGLINE BUCKETS

IN LATIN AMERICA

ARGENTINA

Argentine government has fixed the price of uranium, for which sole purchaser will be the National Atomic Energy Board. Explaining the listed prices, the government, which is out to stimulate an Argentine "mining conscience," said that these were aimed to promote a stable market and fair profits for the operators.

Price is 280 pesos per kilo of U_3O_8 for minerals with a minimum 0.20% oxide yield, plus 100 pesos for each kilo of U_3O_8 over four contained in each ton of dry mineral.

For minerals with less than a 0.20% content and for compounds the price will be set individually.

In the preamble of the decree, local authorities note that it is motivated by Article 40 of the new Constitution which establishes that minerals and natural energy resources are the "imprescriptible and inalienable property of the State."

Plant for the flotation treatment of uranium and nickel, and fluorite for the metallurgical industry, has been opened in the outskirts of Buenos Aires.

Plant, a 3-million peso investment, is operated by Metalmina, S.R.L., a subsidiary of Minera Alumine, S.A. With present capacity, company is obtaining uranium commercial concentrates with 80% recovery, and nickel commercial concentrates with a 95% recovery.

1954 production figures for minerals and ores considered strategic in Argentina and handled exclusively by I.A.P.I.—the official trade body—were announced.

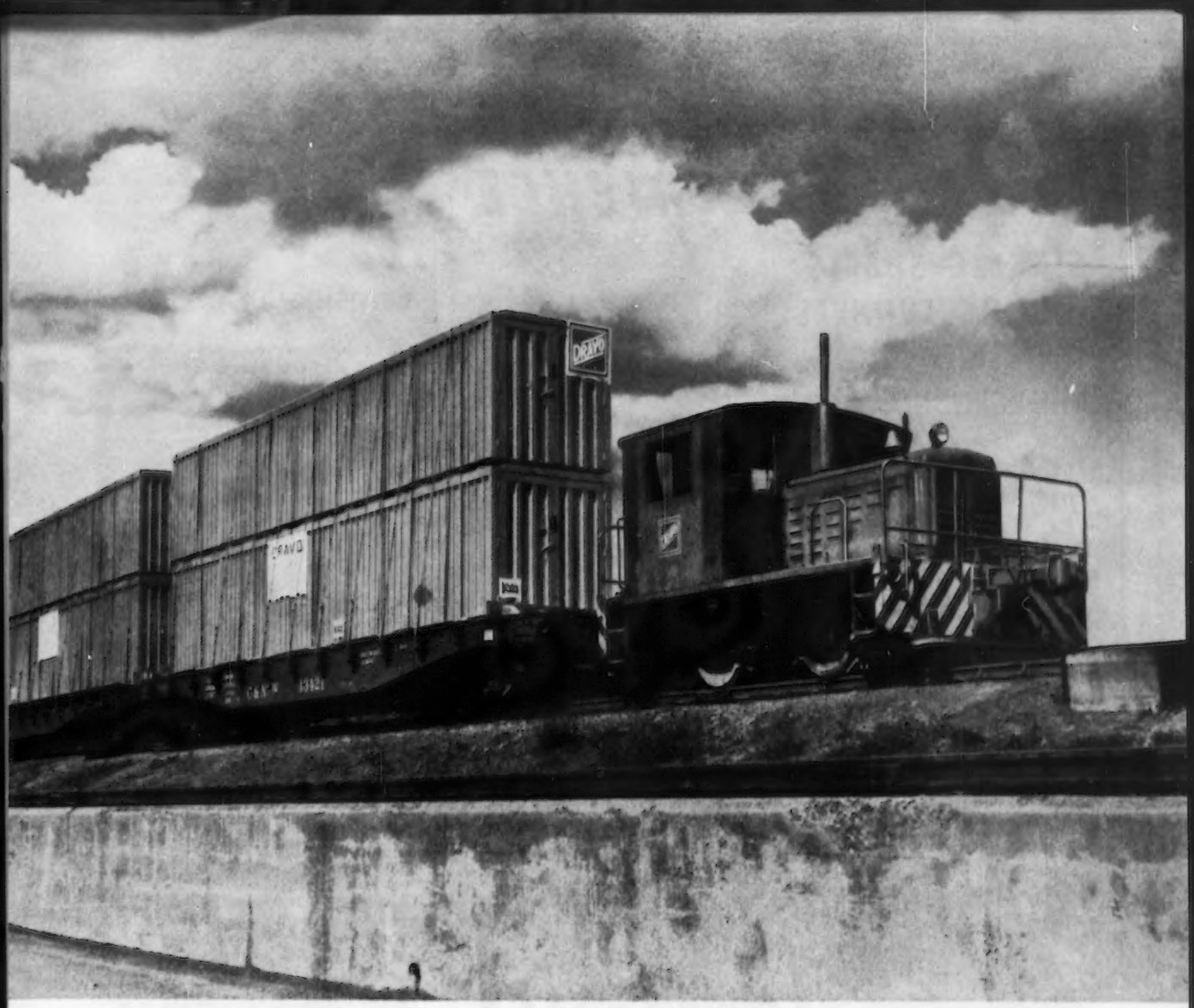
Beryllium output, 10.8% BeO, all purchased by I.A.P.I., amounted to 1,980 metric tons, a 28% increase over 1953 production. Wolfram, 66% purity, reached 485 metric tons, registering a 3% increase. Scheelite, 65% pure, totaled 437 metric tons, showing a 28.5% increase. All three items are currently stockpiled by I.A.P.I.

I.A.P.I.'s lead ore purchases last year from local production sources totaled 2,230 metric tons, 39% more than 1953. Argentina's normal metallic lead consumption averages 30,000 tons annually. Six to eight thousand tons are currently imported; the local National Lead Co. supplies approximately 20,000 to 21,000 tons, and the rest is furnished by some six small foundries, which is marketed through I.A.P.I.

I.A.P.I. is holding a stock of 2,500 tons of graded mica. Demand from the U. S. has declined since 1953. Total volume of business handled by I.A.P.I. during 1954 reached 82-million pesos.

BOLIVIA

Corporación Minera de Bolivia has announced it will expand the mines of



Baldwin Diesel-hydraulic proves its durability and economy for 14 years at Dravo

After 14 years of service this 20 ton Baldwin Diesel-hydraulic locomotive can still handle tough assignments for Dravo Corporation. Kept on round-the-clock duty during the war years, this rugged industrial locomotive moved heavy loads of steel, fabricated parts and other material throughout Dravo's Neville Island yards near Pittsburgh. Loads frequently were from 130 to 170 tons gross train over trackage which, in some places, has a grade of 3%.

Many of the locomotive's points of pick-up and delivery were in areas of heavy sand-blasting operations. Even though running gear and engine were exposed to this abrasive atmosphere, its service availability during the years of 1942 to 1945 was three times the normal expected use of a yard locomotive.

Dravo also found their Baldwin saved a lot on maintenance and repair. When it was still operating full time, actual maintenance costs averaged less than $200 a month. Since their purchase of a new and larger Baldwin 40 ton unit, the old locomotive still serves as a dependable stand-in when the new one is out for inspection.

You too will find Baldwin Industrial Locomotives mean savings in a wide variety of operating conditions.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON
Industrial Locomotives

35 Years of EXPERIENCE

SINKING SHAFTS
DRIVING TUNNELS
DRIFTS AND
UNDERGROUND WORK

Our Service Includes

- CONSULTING
- DESIGN
- CONSTRUCTION

Our many years of experience assure you of ability and "Know-How" in solving the difficult problems confronted in this work.

For a good job call an Expert—

FRAZIER-DAVIS
CONSTRUCTION COMPANY
SAINT LOUIS, MISSOURI

1½ TON 6"
Load-Rated!
for safety
CROSBY
BLOCKS
You can't go wrong with Load-Rated Crosby Blocks. The working capacity of each block is embossed on the side plates.
CROSBY PRODUCTS DIVISION
AMERICAN HOIST & DERRICK CO. St. Paul 1, Minnesota

Bolivia *(Continued)*

Tasna, Morococala and Kami, in order to get "a greater recovery on tin and wolfram concentrate minerals." It is planned to raise capacity of mines to: Tasna, 40%; Morococala, 20%; and Kami, 80%.

BRITISH GUIANA

Canadian-owned company has been granted a 33-year lease to develop manganese deposits in an area of 60 square miles in British Guiana.

According to a government press statement, lease will open up a new field of economic development in the colony and British Guiana may become an important factor among world sources of manganese.

CHILE

U. S. will provide technical assistance for the production of uranium in Chile, where preliminary surveys have resulted in establishing its existence.

Eight months ago Chile informed the U. S. Government of the country's uranium mining prospects, and the AEC is now reported to have made known its interest. Official talks are under way between the U. S. Embassy in Santiago and the Minister of Mines in regard to a project of exploration and development of uranium deposits known to exist in Chile.

Chile has sold 20,000 metric tons of electrolytic copper to Great Britain with payment to be in pounds sterling. Copper will be delivered at the rate of 2,000 metric tons per month beginning in July.

Paulino Callejas & Sons, owners of several mines and mills in Central and Northern Chile have increased the capacity of the Farellon Sanchez copper mill to 550 tpd. Private firm also owns the Petorca cyanide gold mill, the Farellon Sanchez mill, the Capote Aurífero gold and copper mill and the new Morado copper flotation mill.

Central Bank has announced that from Jan. 1 to Feb. 19 it has sold 60,714 metric tons of copper, of which 37,868 tons have been sold to Europe and 22,846 tons to the U. S. It is hoped that Chile's output of copper will reach 420,000 metric tons this year.

Compañía Minera Disputada de Las Condes has increased its milling capacity to 650 metric tpd by installing Symons crushers and feeding its 6x6-ft Allis-Chalmers ball mills with finer feed. Capacity of the 7km Pohling ropeway from mine to mill has also been increased by enlarging the size of the ropeway buckets and installing more towers.

Compañía Comercial y Minera Sali Hochschild has started its new 70 metric tons per day leaching plant at Copiapó, Atacama province, a slime plant with the copper in the oxide ores being dissolved

MODERN SCHEDULES DEMAND—POWER...

FLUID POWER

Vehicles that haul 75 ton loads... Shovels that handle 16 yards and more at a single bite... these are but two of the many juggernauts that move mountains or mole hills... that give industry *higher production at lower cost.* And the key to velvet-smooth control of all this harnessed energy is Fluid Power!

Mine, Construction, Marine, Oil Field, Farm and Materials Handling Equipment attain ever-increasing productivity through the rugged dependability of Fluid Power. Machine Tools, Presses, Paper Machinery, Petro-chemical and other processing equipment achieve greater automation plus micrometric precision through Fluid Power.

There are three divisions of The New York Air Brake Company which concentrate on the development of advanced design hydraulic equipment for this Fluid Power. Thus, from a single source, industry may have the ideal component for the specific function. . . . Gear, Dual-Vane and Piston Pumps, embracing a full range of capacities and pressures to 5000 psi, and Motors, Control Valves and Cylinders to develop complete hydraulic circuits.

In addition to Fluid Power, industry finds the answers to its liquid handling problems in Aurora and Kinney Pumps. "Any material that can be pushed through a pipe"... from gasoline and alcohol to tars, sludges, slurries and other heavy semi-solids ...and the less dramatic tasks of sump, deep well, boiler feed, and household needs are all dependably handled by these famous pumps.

Write today for literature containing hundreds of ideas for you to improve your product, increase production and lower costs.

DUDCO DIVISION
Hazel Park, Mich.
Dual-Vane Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 7 to 140 hp; 2000 psi operation. Piston-Type Pumps for 5000 psi.

HYDRECO DIVISION
Cleveland, Ohio
Gear-Type Hydraulic Pumps, 3 to 120 gpm; Fluid Motors, 3 to 52 hp; Cylinders; Control and Auxiliary Valves; 1500 psi.

WATERTOWN DIVISION
Watertown, N. Y.
Railroad air brake valves for freight and passenger equipment, STRATOPOWER Hydraulic Pumps for Aircraft, to 3000 psi.

KINNEY MANUFACTURING DIVISION
Boston, Mass.
Rotating Plunger and Heliquad Liquid Handling Pumps, to 3000 gpm. Vacuum Pumps, 0.2 micron, evacuate 1800 cfm.

AURORA PUMP DIVISION
Aurora, Ill.
Liquid Handling Pumps, Centrifugals, 4000 gpm, 500 ft. heads. Turbine-Types, 7000 gpm. Condensate Return Units.

THE NEW YORK AIR BRAKE COMPANY

230 PARK AVENUE • NEW YORK 17, N. Y.
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

I'M SOLD ON

WEDGE WIRE SCREEN GUARDS

They're Rugged, Dependable, and give Long Life Performance

The screen guard is built into the screen and the guard bars permit only the finer particles to pass over the screen. This item can be furnished in special sizes to your requirements in practically any type of long wearing metal.

Complete literature is available. These screen guards are non-clogging, non-blinding, and are strong, rigid, uniform and extremely economical.

Wedge-Wire CORPORATION
Gas Street at Nickle Plate R. R.
Wellington, Ohio

WEIGH WITHOUT STOPPING
WHILE YOU CONVEY

Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO. PASSAIC N. J.

Chile *(Continued)*

in mechanical agitators and the washing done by countercurrent decantation.

Precipitation is carried out on scrap iron. Sulphuric acid is produced in a 20 metric tpd Lurgi contact plant.

Compañía Minera Tamaya, owner of a controlling interest in Las Chivas copper vein near the shore of Buenos Aires lake, is going ahead with development of 14% copper deposit which already has 40,000 tons of ore blocked out. Company will build a small smelter to produce blister copper at the mine site.

The President has vetoed 10 articles in the bill approved by Congress giving a new deal to the U. S. copper companies. The principal articles vetoed by the Executive are: that which gives the Central Bank (Chilean FRB) the right to nominate two directors in the board of the new agency, to be known as the Copper Department instead of the Copper Institute, which will control the operations of the U. S. companies operating in Chile.

Foreign Exchange Control Commission has refused Fundición Nacional de Paipote, the government copper smelter at Copiapó, the necessary dollars to import a new Babcock and Wilcox boiler for the smelter.

International Illinois Iron and Zinc Corp. intends to work iron resources in Taltal, Chañaral, Copiapó and Iquique, says John Doyle, president.

Purpose of his recent trip to Chile, Doyle explained, is to initiate exploitation of high-grade iron ore, commonly used to partly replace scrap iron in the production of pig iron. He pointed out that the size of the ore chunks should be exact, 2x4 in., in order to serve its purpose. Meeting these conditions, Mr. Doyle further stressed, "this high-grade Chilean iron ore could find a stable market in the U. S." Known as "colpa" in Chile, the ore generally averages over 60 to 62% iron content, and contrary to the low-grade ore currently consumed by the Huachipato open hearths, it is reserved for the export market.

COLOMBIA

Old Marmato mines in the municipality of Marmato, Caldas, between Manizales and Medellín in the Western Cordillera, will see large scale exploitation, with modern machinery, shortly.

Mining Enterprises Corp., Panama, formed mostly by ex-U. S. Army officers, has signed a 25-year contract with the Colombian government to exploit the government-owned mines. Company hopes to process 300 tons of mineral a day. With a gold content of 11.3 g of gold per metric ton of prospected mineral and of about 8 g of silver per ton, these mines are expected to yield good profits. Prospected mineral alone is estimated at $16-million.

Peter Grace, president of W. R. Grace & Co., has announced that his company will invest $10-million in Colombia during the next five years. Among the projects mentioned is an aluminum plant in Barranquilla.

One of the two known bauxite deposits in Colombia, in the Medellín area, is being explored carefully for its commercial possibilities. The other, on the Vaupes River, in the south, is too far away for commercial exploitation at present.

Compañía de Bomboná, S.A., Medellín, is exploring bauxite deposits discovered near Santa Rosa, Antioquia. Concession taken out by the company covers an area of 5,000 hectares (12,355 acres). If deposits prove commercially exploitable the company will refine mineral on the spot. Santa Rosa is located on the Guadalupe River, which supplies part of the electric power for Medellín and experts believe the generating capacity of the river can provide the extra 200,000 kw which should supply the necessary power for the future refining plant.

IN AUSTRALIA

Australia has shipped its first commercial consignment of uranium oxide to the United States, according to official sources. Uranium, worth £A200,000, was produced at the Northern Territory's Rum Jungle refinery under a 10-year agreement with the Anglo-American Combined Uranium Development Agency.

This and future shipments will help to repay the £A3-million Agency loan which financed Australia's only producing refinery. Another plant, at Radium Hill, South Australia, has not reached the commercial shipment stage.

Appreciable increase in uranium production at the Rum Jungle refinery is expected before the end of 1955. First commercial shipment of uranium oxide to the U. S. was worth about half a million dollars. Revenue from shipments in the first 18 months will be used to repay the Combined Agency loan for the setting up of the plant.

Government sources emphasized that only uranium oxide will be exported. Federal Government has plans to carry out the complete refining process in Australia but this is unlikely before Australia is ready to use uranium for industrial power.

North Australian Uranium Corp. Ltd. reported that drilling has revealed proved and profitable ore at the Sleisbeck field. Initial estimates, claimed to be conservative, put the value of the find at £A700,000. Find was on No. 4 exposure. Drilling did not reach the end of mineralization line and it was expected that further substantial ore reserves of a similar type and value would be found. Company proposes to seek a U. S. loan for further prospecting and, perhaps, for erection of a treatment plant if justified by extensive drilling.

Bessemer

operation proves that Hazacords can take punishment

All the units in this operation are "big bruisers" selected for ability to operate on a big scale under the most difficult conditions. At this Bessemer Limestone and Cement Company limestone quarry the five-cubic-yard dippers can load at the rate of 400 tons per hour. The blasting, rock dust and rough ground mean that only top quality materials can keep all operating equipment from trucks to electrical cables continually on the job.

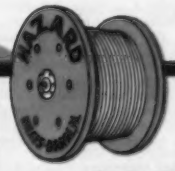
Operating at 4160 volts, the Hazacord Type SH-C, 5-kv portable cables have proved themselves able to withstand the worst treatment this operation can provide. The extremely durable Hazaprene ZBF sheath is excellent protection against the constant scraping, twisting and dragging that is normal in this type of operation. Hazard Keystone rubber insulation and shielded construction provide long electrical life and maximum protection for personnel when handling the cables.

No matter what the type of installation, there is a Hazard cable that will handle power distribution up to 15,000 volts. Ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, New Jersey.

Overall shielding on this Hazacord high voltage cable reduces hazards of shock to men who come in contact with the cable during operation.

Hazacords are known for their reliability in blasting operations such as this where there is constant threat from impact and sharp uneven surfaces.

Hazacords give long service even when dragged continuously over rough, destructive terrain like that shown here.



HAZARD
insulated cables

PRODUCT OF OKONITE RESEARCH

2445

Bee-Zee
Screens
make
you
money
with
SELECTED SHAPE . . .

Whatever result you're after—precise sizing, complete deliquefying, longer screen life—Bee-Zee has a screen *shaped* for the job. Get the entire story on these 100% stainless steel screens that resist abrasion, rust and chemical corrosion. Pick up the phone, dictate a letter or wire us for complete facts. Bee-Zee Screens are welded on highly accurate electronic equipment . . . can be fitted to any screening machinery you operate.

CALL COLLECT — GALESBURG, ILL. 4397

BIXBY-ZIMMER ENGINEERING CO.
555 Abingdon Street, Galesburg, Illinois

Bee-Zee Tri Rod gives you "sharp-as-a-knife" separation when a high degree of accuracy is demanded.

Bee-Zee Round Rod holds its accuracy even when rods are worn *halfway through.*

Bee-Zee Grizzly Rod combines the best features of round and tri-rod.

Bee-Zee Grizzly Rod with protective skid rod guards against abrasive action without sacrificing efficiency or percentage of open area.

BIXBY-ZIMMER Engineering Co.

Australia *(Continued)*

Australian price of copper was raised to a record (for Australia) £A381 a ton. This represents a rise to consumers of £A71 since the price of copper was decontrolled in October 1954.

With wolfram prices back to £A1000 a ton, a revival of the industry at Hatches Creek, Northern Territory, is imminent. The battery on the field was already reopened and some prospecting, although on a restricted scale, was resumed. Reports were received of a new rich strike of wolfram at Wauchope field, near Tennant Creek.

Rich wolfram samples were also reported by Torrington Uranium Mines N.L. Samples from Finnegan's lease assayed between 2 and 7.5% wolfram. The shaft has been sunk to 30 ft in good quality battery stone. A dividing shaft has been sunk to six feet showing good values of wolfram more than 8 ft wide.

Australian output of zinc will be cut by about 20,000 tons a year. This follows the reduction in supply of electric power to Electrolytic Zinc Co. of Australasia Ltd. The reduction was caused by deterioration in water supply to the hydroelectric system.

Australasian Oil Explorations Ltd. intends to change its name and to concentrate on metal mining activities. It proposes to acquire large gold and antimony leases where development was held up by shortage of funds. Its initial interests will be mostly in Western Australia.

There is a revival of interest in prospecting for rutile. Australian rutile prices have risen by about £A20 since mid-1954 and heavy bookings for the finished product have been reported by several producers.

During January the Mt. Isa Mines mill treated 97,370 tons of ore made up of 56,685 tons of lead-zinc and the remainder of copper ore. An improvement in wagon supply enabled more than 4,000 tons of zinc concentrate to be railed during the month, highest since May 1954. Lead production was also particularly good at Mt. Isa Mines during January. An experimental shipment was made to England of more than 400 one-ton blocks of lead. Copper smelter production is at a rate of over 60 tpd. Changes made to reverberatory-furnace slag granulation has made the job of tapping slag safer and easier. Coarser slag from the new water jet has a faster settling rate tanks and eliminates much of the trouble associated with carryover of excessive "fines" into the main water pond.

Rio Tinto Co. intends to work intensively on proving the Mary Kathleen uranium deposit in Queensland but it was still carrying out active exploration of selected leases in the Northern Territory.

Rich gold values are reported by Central Mines N.L. from its Burnt Shirt lease. Values of up to 3 oz a ton are reported and most promising formations were also reported from the Patties lease.

LONGER WEARING
LOWER COSTS
BETTER RESULTS

BOOTH FLOTATION MACHINES

GIVE ALL OF THESE

•

It's One Way To Meet Competition And It's Your Best Bet For 1955

URANIUM ORES

SPECIALIZED TREATMENT FOR LOWER PLANT AND OPERATING COSTS. COMPLETE ORE TESTING FACILITIES

the BOOTH company
Incorporated

333 West 14th South Street
Salt Lake City, Utah
MINERALS SEPARATION
MANUFACTURE • EQUIPMENT

NEW! for U_3O_8
1955 MODEL DR-299
NUCLIOMETER

$545.00 IN USA

3 INSTRUMENTS IN ONE... NO PRICE CHANGE!

Check these unique features!

- THREE IN ONE: Probe Geiger—Radiometric Assays—Ultra-sensitivity for low level radiation.
- ALOFT OR ON WHEELS: Low level anomalies at a glance. 4 time constants, 6 ranges from 20.0 to 0.01 MR/HR, for surface or carborne work!
- HOT OR COLD: 6 miracle Bismuth, 18 powerful Geiger tubes defy temperature extremes. No more heat failure of delicate crystals and circuits!
- COMPLETE: Instrument includes rugged leather case, probe, assay-sample holder. Nothing else to buy! Pack weight, just 10½ lbs.
- GUARANTEED FOR SURE: Take 10 days to prove it! Return in new condition for cheerful refund if you don't think this instrument is absolute tops!

May we bid your exploration, ore finding or management job? Airborne methods & photogeology by mining geologists with 30 years cold-dollar experience. Open pit or underground exploitation from claim to concession. Write or wire for details.

STRATEX INSTRUMENT COMPANY, INC.
3515B Sunset Blvd.
Los Angeles 26, USA
EXPLORATION COMPANY

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.

COPPUS ENGINEERING CORPORATION
285 Park Avenue, Worcester 2, Mass.

Please send ..... Bulletin 130

Name .....

Company .....

Address .....

VICTAULIC METHOD OF PIPING

VICTAULIC COUPLINGS

Styles 77, 77-D for standard applications. Simple, fast to install—sturdy and reliable. Sizes ¾" to 30". Style 75 Light-Weight Couplings for light duty applications. Sizes 2", 3", 4". Additional styles for cast iron, plastic and other pipes. Sizes through 60".

VICTAULIC FULL-FLOW FITTINGS

Complete line of Elbows, Tees, Reducers, Laterals, etc.—to fit all Victaulic Couplings. Streamlined for top efficiency, easy to install. Sizes ¾" to 12".

VIC-GROOVER TOOLS

Handy, on-the-job grooving tools that do the work in half the time. Light weight, easy to handle—operate manually or from any power drive. Automatic groove position and depth. Sizes ¾" to 8".

ROUST-A-BOUT COUPLINGS

Style 99 for plain or beveled end pipe. Best engineered, most useful plain end joint on the market. Simple, husky — easy and fast to install. Takes strong bull-dog grip on pipe. Sizes 2" to 8".

VICTAULIC SNAP-JOINTS

Victaulic's new boltless, speed coupling. — Style 78 — hinged into one assembly. Hand-locks for time and dollar savings. Sizes 1", 1½", 2", 3", 4".

EASIEST WAY TO MAKE ENDS MEET

Promptly available from distributor stocks coast-to-coast. Write for NEW Victaulic Catalog-Manual 55-5C.

VICTAULIC COMPANY OF AMERICA

P. O. Box 509 • Elizabeth, N. J.

IN THE PHILIPPINES

Lepanto Consolidated, largest copper producer in the Far East, milled 408,900 tons in 1954 averaging 4.0% copper and 0.2 oz gold per ton. Mill produced 67,549 tons of concentrate, averaging 23.1% copper and 1.0 oz gold. Total copper output in 1954 was 15,657 tons, with 68,013 oz of by-product gold and 235,597 oz of silver. Production of copper and gold increased 16.4% and 42.5%, respectively, over 1953. Ore reserves at the year-end totaled 2,789,430 tons, averaging 4.03% copper and 0.15 oz gold per ton. This is sufficient for nearly seven years' requirements at the 1954 milling rate. Company has placed a small test plant in operation to study the heavy-media process as a means of possible pre-concentration of the lower grades of ore in the mine.

Copper ore reserves at the Toledo Copper mine are officially reported at 37,600,000 tons averaging 1.02% copper. Exploration work continues and the limits of the ore deposit have not yet been reached. Studies are now being made of the economic feasibility of installing both a sulphuric acid plant and a fertilizer plant at Toledo to obtain maximum utilization of the pyrites which will be produced in large quantities. The advance loan of $750,000 given by the Mitsubishi interests in Japan has been increased to $1,100,000. This loan is to be repaid over a period of three years through a deduction of 3c per pound on the copper in the concentrates to be shipped to Mitsubishi.

A contract has been signed by Samar Mining Co. for delivery of 1-million tons of iron ore to Japanese steel mills over a period of three years, calling for shipments of 350,000 tons per year beginning April 1. The company also reports that development work on its gold property in Masara, Davas, is progressing rapidly, with delivery of machinery and equipment expected to be completed by the end of March. It is planned to have the mine in production in July.

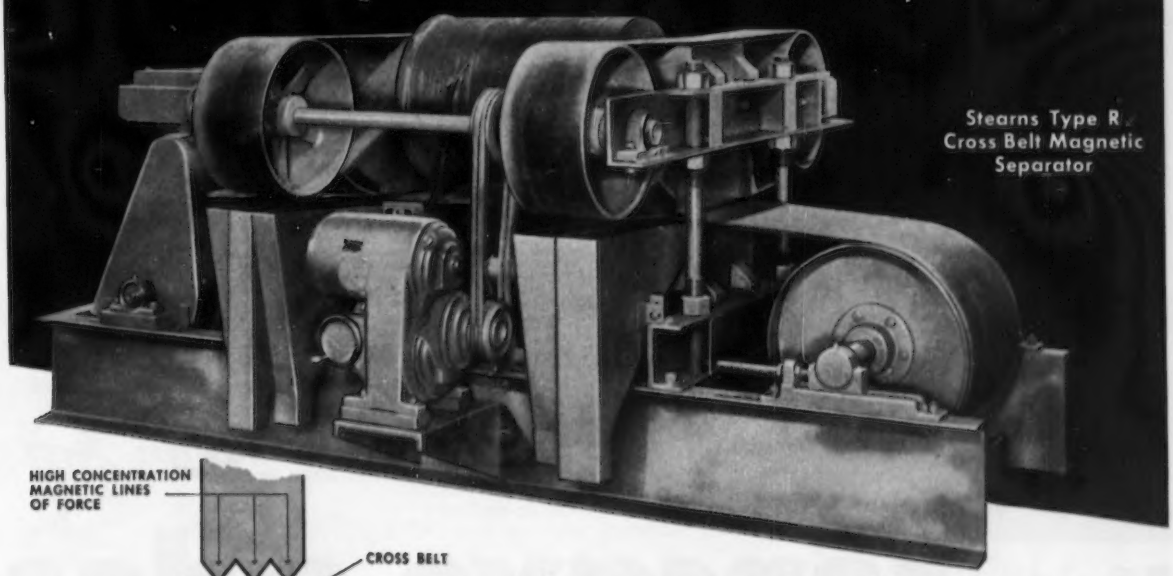
A main haulage tunnel is being driven on the copper prospect of Mindanao Mother Lode in Zambales province. Total length will be about 700 ft. Completion is expected in May. If the orebody checks out with the results from diamond drilling, the company will build a mill.

IN EUROPE

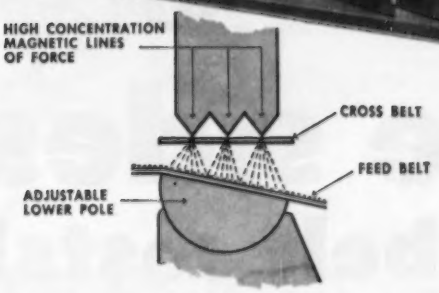
GREECE

Larymna nickel ore mine will be ready for operation next September it is reported. It is expected that the mine will yield 160 tons of nickel iron ore per day and that Greece will earn from its export some $5-million per year. Ore will be processed locally with machinery provided by the German firm of Krupp.

Stearns makes two magnets do the work of five in strategic ore separation



Stearns Type R Cross Belt Magnetic Separator



Exclusive variable pitch lower pole. Simply by varying the pitch of the lower pole piece you can vary the air gap between the upper and lower poles to increase or decrease strength of magnetic lines of force at each point. This enables very selective extraction of distinct magnetic products at each point. The most magnetically responsive ore will be separated at the first or wide gap point. As the air gaps get smaller the magnetically weaker ores are extracted and carried off on the bottom side of the cross belt. Non-magnetic material is carried off on the feed belt.

With this variable pitch lower pole, as many as one non-magnetic and ten magnetic products can be obtained from just two magnets. *To do this same job on ordinary separators would require five magnets, take up much more floor space and cost approximately twice as much.*

Equipped with exclusive, patented variable pitch lower pole, the Stearns cross-belt magnetic separator does more work, faster and at lower cost than comparable units of greater size. It provides amazing control in separating weakly magnetic ores in both placer and hard rock deposits — monazite, wolframite, huebnerite, ferberite, columbite, tantalite and ilmenite. Other special features include:

1. Individual, independent variable speed drives for both cross belts and feed belt . . . an exclusive Stearns feature.
2. Separator is furnished with an electric control panel with rheostat and ammeter to adjust strength of magnet.
3. Design of unit permits closed magnetic circuit — magnetic intensity is utilized at exactly the desired points.
4. All points in each magnetic field are of the same polarity. This, plus the fact that the mineral grain is entering successive points of increasing magnetic intensity, because of the adjustable lower pole, helps to overcome magnetic reluctance in weakly responsive materials.

Stearns maintains a fully equipped laboratory for thoroughly analyzing and testing ore samples. This, plus Stearns' wide experience in the magnetic separation field, assures you of getting exactly the right unit for your needs. Ore samples for analysis or requests for information receive immediate attention. Write today.

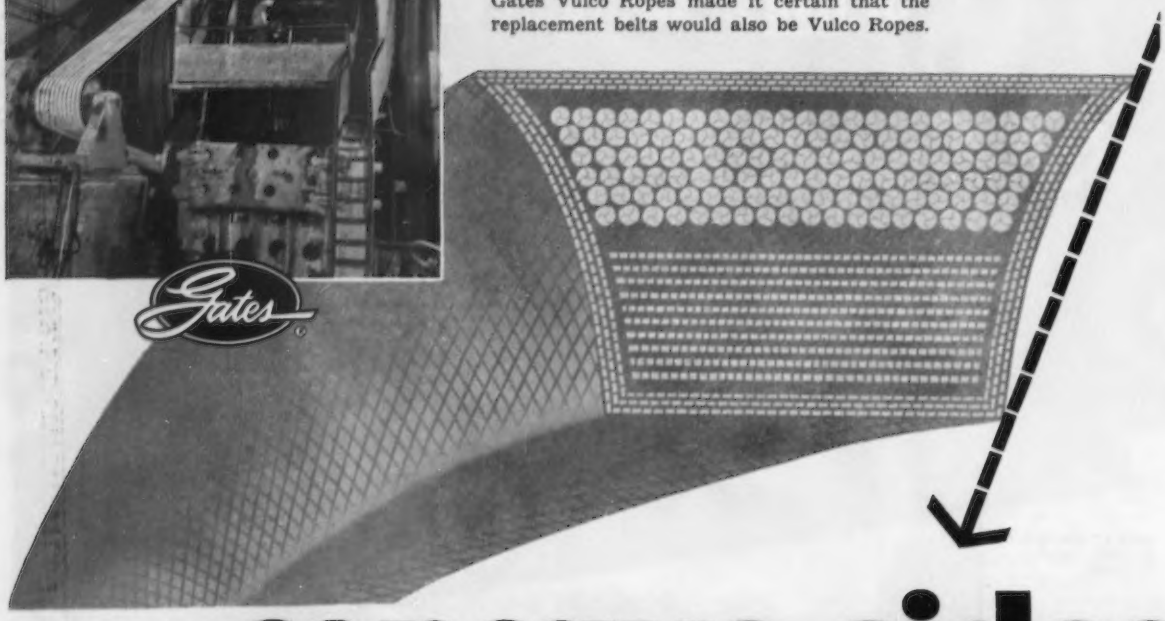
1073

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS MAGNETS

STEARNS MAGNETIC, INC. • 624 S. 28th ST. • MILWAUKEE 46, WIS.

The drive on this huge jaw crusher was changed to Gates Vulco Ropes 12 years ago. 35 million tons of ore were crushed before the belts were replaced. The trouble-free performance of these Gates Vulco Ropes made it certain that the replacement belts would also be Vulco Ropes.



How concave sides cut V-belt costs!

Plants all over the world have made this discovery: Gates Vulco Ropes—the V-belts with *concave sides*—wear longer; cost less per year of service.

Here is the interesting reason why:

When the Gates Vulco Rope is bent around the sheave, the *precisely engineered* concave sides (Fig. 1) fill out and become straight (Fig. 1-A). Thus the belt makes full, uniform contact with the sides of the pulley. You get sure pulling power and *even distribution of wear.*

Longer wear saves not only on replacement costs; it also saves the cost of down-time... keeps equipment producing.

It's easy to prove to yourself the value of concave sides

Simply bend a straight-sided belt (Fig. 2) and *feel* the bulge at the sides around the bend. You will quickly see why the bulging sides prevent an even fit in the pulley groove (Fig. 2-A). Uneven contact shortens belt life...increases belt costs.

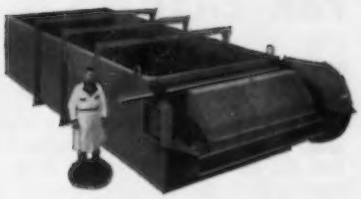
Cut belt replacement time and costs...specify Gates Vulco Ropes—the V-Belt with *concave sides* (U.S. Pat. 1813698). The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

Gates Engineering Offices and Distributor Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA-30-B

GATES VULCO ROPE DRIVES

It's NEW! It's BIG!



EAGLE 48" LOG WASHER

A heavy duty money maker that will economically abrade and scrub ore, crushed stone or gravel . . . year after year.
Handles material up to 8" in diameter . . . capacity to 150 tons per hour (depending upon material size and amount of foreign matter to be removed). Tub is 9'4" wide x 24' or 30' long. Both logs are 48" dia. Sturdy Tubular log shaft . . . no deflection. Enclosed gearing at discharge end as shown.

Send for Catalog 55.

EAGLE IRON WORKS
262 HOLCOMB AVE. DES MOINES, IOWA

Breaker Balls, Pile Hammers, and Line Weights.

URANIUM–TUNGSTEN–MERCURY ZIRCONIUM–ZINC

PROSPECTING INFORMATION! LATEST NEWS AND DATA ON EQUIPMENT AND METHODS

Ultra-Violet Products, Inc.
Dept. EJ, San Gabriel, California
Please send me Prospecting information, description of equipment available, and name of nearest dealer.

Name _____
Address _____
City _____ State _____

ULTRA-VIOLET MINERALIGHT

If you're prospecting for anything, you need a Mineralight.

HERE'S WHY! The Mineralight shows traces not sufficient to excite other responses, and detects minerals which are often found with uranium ore. By itself or teamed with a Geiger or Scintillation Counter, the Mineralight is a must.

Geiger Counters—Scintillation Counters
SEE THE BIG THREE

Fisher Research Laboratory, Inc.	Precision Radiation Instruments	Detectron Co.
Uranium Scout	Lucky Strike	Geiger Counters
Uranium Scout DeLuxe	Professional	Scintillation
Count-O-Scope	Scintillator	Scintron
Scintilla-Scope	Royal Scintillator	Nucliometer

Only at your Mineralight dealer can you see and compare all models made by these three leaders in Geiger and Scintillation Counters and get the latest data on uranium prospecting.

ULTRA-VIOLET PRODUCTS, INC.

NORWAY

A West German firm is seeking a concession for mining a field of magnetite-iron ore in northern Norway, according to a press report here. The field lies in the province of South Troms, runs for 20 miles with six different veins. The report said it is doubtful the Department of Industry will grant the concession.

TURKEY

More than 10-million metric tons of proven ore reserves carrying an average value of 0.44% WO_3 have been established at Uludag, 13 km southeast of Bursa, according to H. N. Pamir, director-general of the Institute of Mining Research and Exploration, Ankara. Continuation of the Uludag deposit for another few hundred feet is almost certain, Prof. Pamir said.

Exploration work has been carried on since 1952, following discovery in 1951 of scheelite-bearing tactite by personnel of the Institute. Work, which lasted to the end of 1954, consisted of 9600 ft of surface and underground drilling and 2250 ft of drifting and shaft. Scheelite mineralization was proved over a length of 1520 ft, with more of the area to be covered by drilling.

Institute of Mining Research and Exploration provides deposition information to Etibank, or a private company, for exploitation of minerals in Turkey. Under a recent law, foreign private enterprise is invited to request concessions.

SWEDEN

One of the world's largest producers of high-grade (60% metal) iron ore, the Luossavaara-Kiirunavaara Corp., is being threatened with nationalization by the current session of the Swedish Riksdag.

Among mines owned by the company are the well-known Kiruna mines, which are now being expanded into the world's largest underground operation. LKAB, as the company is known, has an average yearly production of 11-million tons and the current expansion program will raise this to 18-million tons by 1960. Exports run from 9- to 10-million tons a year.

Under an agreement of 1927, half of LKAB's preferred stock is owned by the Swedish state and the other half by the Graengesberg-Oxeloesund Corp. The state names four directors and Graengesberg names four, while the company's president is named by Graengesberg. It is the president's vote that is decisive in case of a tie.

The same agreement gives the government the right to review the contract every ten years and to buy out the Graengesberg holding. This ten-year period is not up until Sept. 30, 1957, but according to the contract the decision must be made by Sept. 30, 1955, which throws the question into the lap of the present Riksdag.

The Riksdag committee that has been investigating the question has made its

VENTILATE
THE EASY WAY
WITH
NEOLON®
Neoprene Coated Nylon
FLEXIBLE VENTILATION TUBING

Versus

Ten men, each carrying a 10 ft. length of 12" dia. metallic pipe (total 100 ft.) weighing approximately 1070 lbs.

***Plus* THESE FEATURES:**

- ✓ Easier to install underground.
- ✓ Easier to move from location to location.
- ✓ Unaffected by acid mine water.
- ✓ Cost less than metal pipe—about 20% less and shipped freight prepaid.
- ✓ No "dents" from blasting.
- ✓ Outlasts any other flexible tubing.

✓ CAN'T TEAR!

SEND FOR SAMPLE AND PRICES.

AMERICAN BRATTICE CLOTH CORP.
220 S. Buffalo St., Warsaw, Indiana

formal proposal that the state buy out Graengesberg's 50% of the stock. The sum, for liquidating the stock and reserve funds, approaches 1-billion kronor ($200-million).

IN ASIA

INDIA

Government of India has framed a new set of rules under Section 6 of the Mines and Minerals (Regulation and Development) Act, 1948, for conserving the country's mineral resources and ensuring development on systematic and scientific lines.

Under the rules every owner of a mine shall have to employ a whole-time or a part-time geologist or a mining engineer, for bringing prospecting and mining operations into line with approved practices. Rules came into force April 1, 1955.

Deposits of sulphide ores to an extent of about one and a half million tons have been discovered in a village in the Chitaldrug district of Mysore State.

Only Geiger Counter with Direct Reading Automatic Scaler-Computer

LOCATING — For accurate, dependable field surveys for locating radioactive deposits

ASSAYING — For on-the-spot assaying and determining profitable truck loadings

CONTOURING — For precision contour mapping

Only **Hoffman Countmaster** offers all these features:

1. Greater sensitivity — highly sensitive to changes in low background activity
2. Positive detecting range to 12,000 counts per minute.
3. 3-scale meter in MR./HR. — accurate in high and low radioactive fields.
4. Scaler-Computer automatically counts for you up to thousands of counts per minute. You can compute dollar value of your ore instantly.
5. Only 7¼ pounds including batteries

Hoffman

COUNTMASTER

Professional Geiger Counter/Assayer

Hoffman
LABORATORIES, INC.

Hoffman Countmaster — designed and manufactured by the makers of the famous Hoffman Radios and Easy-Vision Television and leaders in advanced research in military electronics.

Write for name of your nearest dealer.

A SUBSIDIARY OF HOFFMAN ELECTRONICS, INC. • 3761 S. HILL STREET • LOS ANGELES 7, CALIFORNIA

IN THE FAR EAST

NEW CALEDONIA

Exports of chrome ore from New Caledonia during 1955 are forecast at 20,000 tons for the U. S. and 18,000 tons for France, while the Tiebaghi Chrome Co. (U. S. controlled) is negotiating with the Union Carbide Co. for sale of 50,000 tons of chrome ore.

Total output of the ore in 1954 was 85,000 tons against 121,000 in the preceding year. Average metal content was 52%. Exports amounted to only 60,000 tons against 112,000 tons in 1953. U. S. took 27,000 tons, Norway 17,000, France 13,000 and Australia 300 tons.

Production of smelted nickel was a record in 1954 at 9,000 tons (of recuperable nickel contained in fusion products) against 6,000 tons in 1953. France took most of the production—only 57 tons going to Japan.

Nickel Company of Noumea is reported to have signed a contract with the Pentecote group at Kouaiou on the east coast for the treatment of 150,000 tons of ore averaging 4%.

Kouaiou area is now extracting ore from open-cuts with mechanical equipment. Pentecote group has opened a new mine on the west coast with an estimated monthly production of 5,000 tons of low grade nickel ore. Ore from the new mine is for Japan, with first shipment in April.

MALAYA

At the end of 1954 there were 79 dredges mining tin in Malaya, 567 gravel pump mines, and 73 mines of other types. Total production in 1954 of tin-in-concentrates was 60,690 long tons.

Nineteen fifty-four tin production is 8% above 1953, and 5½% above 1950, which was previous postwar high. Average production per dredge rose 9%, although the number of dredges remained about the same. The number of gravel pump mines rose 4%, but average production per mine remained unchanged.

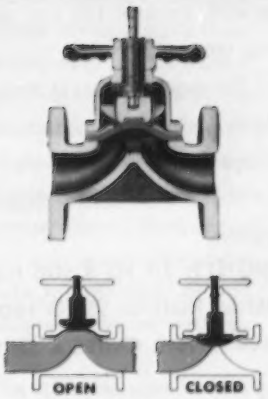
An extensive survey is being carried out at the Temangan Iron Mines in Kelantan, by Boustead and Co., to determine if there are economically mineable quantities of ore. The survey will be completed by the end of July, at which time a decision will be taken whether to set up a company with capital provided by Boustead, a Japanese firm, and another English firm operating in Japan. These mines were worked by the Japanese before the war, and ore has a ferrous content about 55%, with a high manganese content.

In Johore, the Sri Medan open cast iron mine, closed during the occupation, has started up operations. To date there have been no shipments, but the ore will presumably be shipped to Japan, as in prewar operations.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

In hundreds of installations, the maintenance-saving design of Grinnell-Saunders Diaphragm Valves has accounted for important economies of labor and money. The only part that will in time need replacement is the diaphragm, and depending on the type of service, it may last for years. To replace it takes only a few minutes. You merely remove the four bolts holding the bonnet, leaving the body in the pipe line . . remove the worn diaphragm, insert the new diaphragm . . replace the bonnet and bolt it down. No refacing or reseating required . . no packing glands to demand attention.

Originally perfected for air and water service, Grinnell-Saunders Diaphragm Valves are now widely specified for many other applications. They greatly reduce replacement and maintenance expenses, especially in lines where corrosion, abrasion, contamination, clogging and leakage can be costly factors. Write today for the Grinnell-Saunders Diaphragm Valve Catalog . . and assign your next valve problem to Grinnell.



Other Important Features:

Diaphragm absolutely isolates working parts from the fluid stream

Diaphragm lifts high for full, streamline flow in either direction

Diaphragm presses tight for positive closure

Body, lining and diaphragm materials to suit service

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island — **Coast-to-Coast Network of Branch Warehouses and Distributors**

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

NEW VULCAN-DENVER EXTRA HEAVY DUTY 50h.p. SLUSHER HOIST

New Vulcan-Denver double drum single shaft 50 h.p. slusher hoist.. 1 of 13 operating in this western mine. Selection of Vulcan hoists was based on this company's successful experience with Vulcan's 150 h.p. slushers during the past 20 years.

The rugged design of these units features extra heavy gears, shafts, bearings and a special all-steel high-rated motor...to assure dependable operation.

HOISTS: 10 TO 1,500 H.P.
SLUSHER HOISTS: 15 TO 150 H.P.
ALUMINUM CAGES & SKIPS

See our advertisement in the E. & M. J. GUIDEBOOK

Vulcan-Denver

VULCAN IRON WORKS COMPANY

1423 STOUT, DENVER, COLORADO

Malaya *(Continued)*

Straits Trading Co., is building a new smelter in Butterworth (opposite Penang) which they hope to open in 1955 or 1956. It will be able to handle the full production of the Federation. When it is in operation, Straits will probably shut down their present smelter in Singapore, which is pretty much outdated.

Production of iron ore was 1,212,780 long tons in 1954. This came entirely from the Bukit Besi mine of Eastern Mining and Metals Co., which is operating at almost full capacity (1,300,000 long tons). Ore, which has a ferrous content of 58%, is shipped almost entirely to Japan. About 150,000 tons per year are sent to Europe, but freight rates are prohibitive.

Primary ore is excavated by shovel and tractor, put through a crusher, loaded by conveyor belt into railroad cars and dumped at the jetty at Dungun on the East coast. From the stockpile it is transferred to lighters, and hand-loaded from the lighters onto ships at anchorage 2 to 3 miles offshore.

Wash ore is dug separately, put through the washing plant at the mine, and then transported to the jetty. Grading is done from the stockpile at the jetty.

Total investment in the Bukit Besi mine is about 10-million Straits dollars, or US $3,300,000. As much as Straits $1-million is allowed per year for replacement and modernization, for both mobile and fixed equipment. Much of this is carried on in the company's equipment shop.

Present equipment comprises 2 Lorain steam shovels, 4 Manitowoc shovels, 8 D8 Caterpillar tractors, and about 12 Euclid trucks. There are also drills for exploration and explosives.

Total labor force is about 2,000; of which perhaps 90 are administrative and clerical, 250 skilled operators, and the rest manual labor.

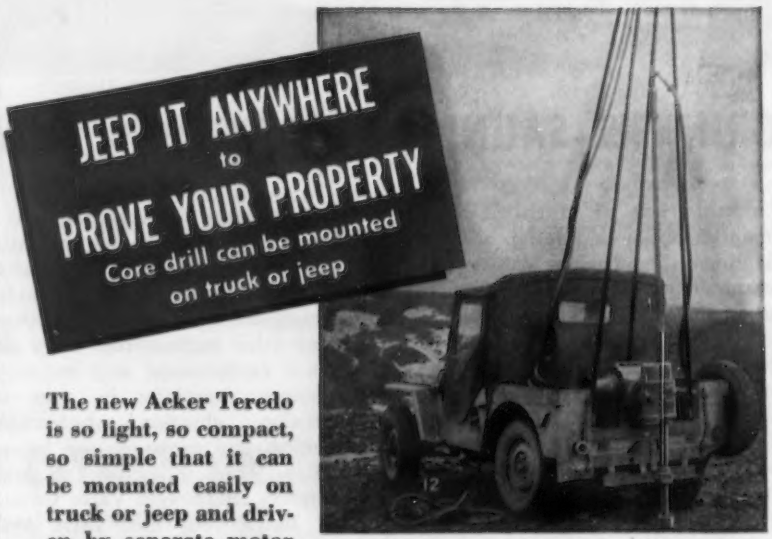
The mine is expected to continue present operations while the ore lasts, which should be at least ten years.

IN THE NEAR EAST

ISRAEL

Dr. Dov Joseph, Israeli Minister of Development, has told the parliament that a copper plant with an annual output of 6,570 tons of copper is being erected north of Elath—on the site of King Solomon's copper mines.

Work on the plant, he said, was due to begin next month and it was hoped that by October 1956 the plant's equipment would be installed. Production was scheduled to begin by the end of 1956. He indicated that equipment for the plant had been ordered from West Germany with reparations funds.

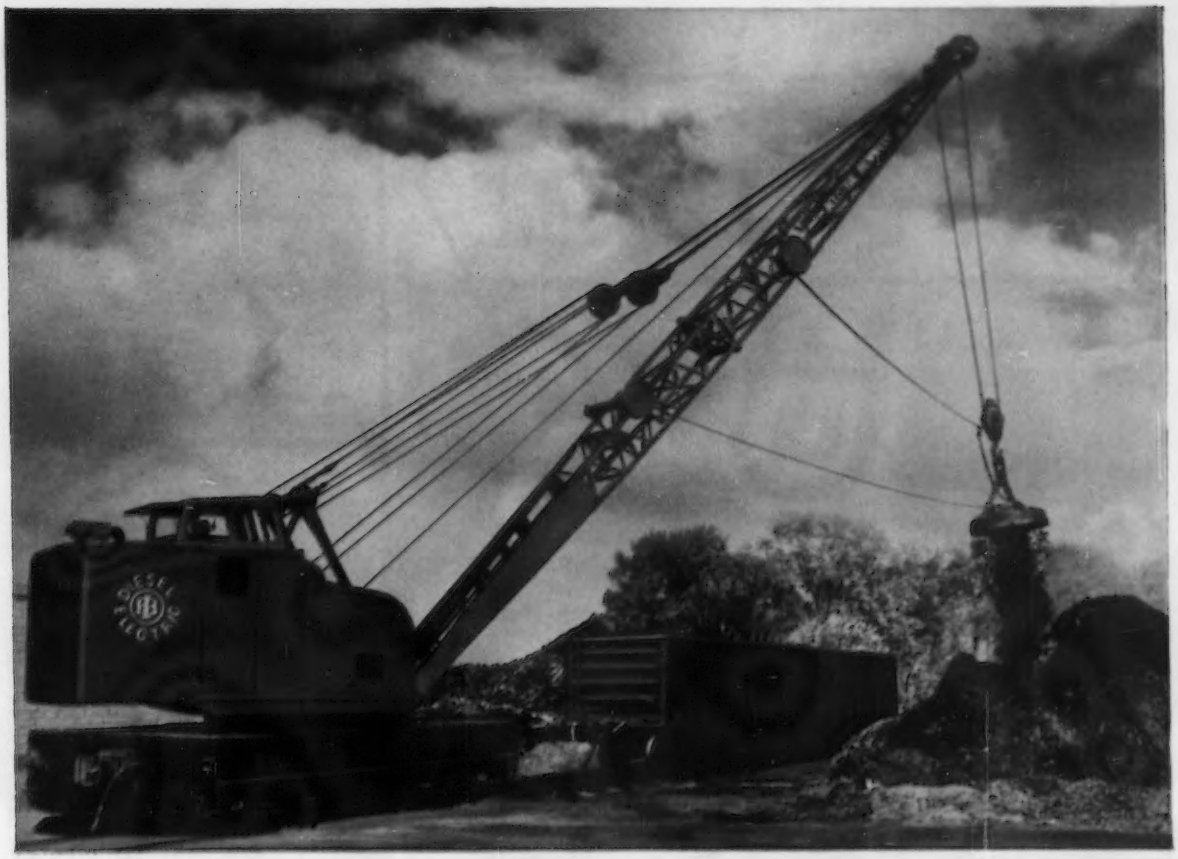


The new Acker Teredo is so light, so compact, so simple that it can be mounted easily on truck or jeep and driven by separate motor or power take-off. Small as it is, the Teredo is a high capacity, fast-operating unit capable of extracting cores up to 2 3/16" in diameter and of drilling to depths of 600 feet.

Send for Bulletin 30-EMJ.

ACKER DRILL CO., Inc. 725 W. Lackawanna Avenue Scranton, Penna.

Manufacturers of a complete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment



With magnet hook or bucket... BROWNHOIST speeds the job

Brownhoist Cranes are helping maintain high production schedules in mines, steel mills, factories, and scrap yards . . . in fact, wherever there are railroads throughout the world. Brownhoist Diesel-Electric Locomotive-Cranes, for all their husky size, handle easily. Their patented Monitor Type Cab and Clear-Vision Boom give a 360° view. Operating controls are within easy reach. Electric travel permits operation as a switch engine as well as a crane. Constructed to last for many years with little maintenance. Brownhoist Diesel-Electric Cranes are available in capacities from 25 to 100 tons. For complete information, consult your nearest Brownhoist representative or write us today.

181

BROWNHOIST

BROWNHOIST MATERIALS HANDLING EQUIPMENT GIVES A LIFT TO AMERICAN INDUSTRY

SUBSIDIARY OF Penn-Texas

INDUSTRIAL BROWNHOIST CORPORATION
BAY CITY, MICHIGAN DISTRICT OFFICES: New York, Washington, Pittsburgh, Cleveland, Chicago, Denver, San Francisco, Montreal • AGENCIES: Detroit, Birmingham, Houston

FEATURES THAT CLIP CYCLE TIME

During each shift, an Athey PR21 Rear Dump Trailer can make more load-haul-dump-return cycles than ordinary rear dump haulers. The reasons: The PR21 makes 90° turns, gets spotted faster. Its wide, open-mouthed body is easier to load. Top tractor gears are utilized with complete safety. *All* the load is dumped out in a few seconds. And the PR21 Rear Dump Trailer gets back to the loading area quicker.

Get more trips, more payloads, each hour, each day, with the Athey PR21 Trailer. Your Athey-Caterpillar Dealer has more facts. Call on him!

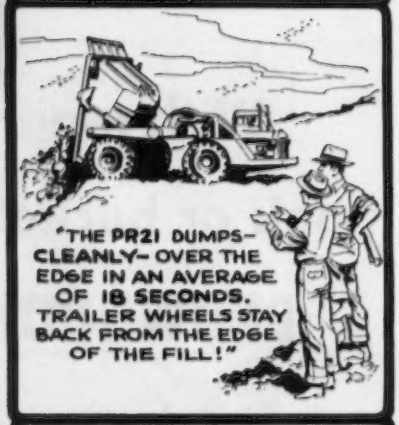
ATHEY PRODUCTS CORPORATION, 5631 West 65th Street, Chicago 38, Illinois

Athey

HIGH SPEED HAULING TRAILERS

Athey APCOR Products

WHAT OWNERS SAY...



MS Connectors are easy to use. Simply tie into "Primacord" trunk line at suitable points for each shot. Delay patterns to suit any conditions are possible with this device.

For better fragmentation, less vibration use DU PONT MS CONNECTORS

Most open-pit operators are in the know about Du Pont MS Connectors. They recognize them immediately as the method of delay initiation used for better fragmentation, minimum vibration and backbreak, and maximum safety.

Du Pont MS (millisecond) Connectors are available in either MS-9 or MS-17 delay periods—intervals found by experience to be most satisfactory. Singly or in combination, these connectors can be arranged to provide an unlimited flexibility of delay intervals. This means the best possible breakage and the least amount of vibration. Backbreak is also greatly reduced.

With MS Connectors no caps are needed until just before firing time—a safety feature that pays off in quick and efficient hookups without worry.

For top performance, safer performance, you'll want to use Du Pont MS Connectors as part of your Du Pont blasting "team." Ask the Du Pont representative in your area for more complete information, or write E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

DU PONT
BLASTING AGENTS
Products of Du Pont Explosives Research

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Who's the best source for a Belt Conveyor?

Barber-Greene—
because they are completely standard, and pre-engineered...
that means you save on design costs and erection time!

see your B-G distributor or write
Barber-Greene
AURORA, ILLINOIS, U. S. A.

SCINTILLATION COUNTERS
Find Uranium 100 times easier

ONE, ALL-PURPOSE COMBINATION SCINTILLATION COUNTER—For the Field—Mobile—Airborne Drill Hole Logging—Assaying
MODEL SC-10 (pictured above)
$595.00
50 ft. Drill Hole Probe for SC-10 . $75.00
NEW IMPROVED MODEL 111-B . . $495.00
AIRBORNE OPTIMUM MODEL SAB-7, with Amplifier and alarm $2810.00

• • • •

ALL TYPES PROSPECTING EQUIPMENT
Geiger counters • Ultra Violet Lights
Drill Hole Probes • Scalers

• • • •

Complete Geological, Engineering, Property Evaluations and Airborne Radiometric Survey Services

ENGINEERS SYNDICATE, LTD.
"The most experienced supplier to the Uranium Industry"
5011 Hollywood Blvd., Hollywood 27, Calif.
Phone NOrmandy 3-9284
BRANCH OFFICES: 337 N. Main St., Moab, Utah
Phone ALpine 3-4381
624 Rood Ave., Grand Junction, Colorado
Phone—3-2921

IN AFRICA

Nchanga Consolidated Copper Mine, Northern Rhodesia, will undertake large-scale open pit mining operations to open up the Nchanga orebody. New area is of lower grade than the Nchanga west orebody which has been exploited up to the present. New deposit will reportedly allow the mine to become a more stable unit and increase flexibility of operations. Initial pit has been laid out on a strike distance of 3500 ft with a view to ultimate depth at 800 ft. Ore reserves are estimated at 33-million tons. It is expected that the pit will have an appreciable extension to the east. Some 7- to 8-million tons of overburden will have to be removed. Stripping operations will be started shortly and production is planned for late 1956 when the extensions to the concentrator and leaching plant will be finished. Target rate of production is 150,000 tons of ore a month.

Preliminary geological survey of various gold, uranium ore, and copper deposits has been completed in Mozambique by the Swedish Bolidens Gruv. AB. Several uranium ore claims have been staked. Subsidiary company, Companhia Boliden de Mocambique Lda., has been formed and a concession applied for to the Portuguese government for an exclusive mineral prospecting right of a large part of the Tete district. Application is also being made for a concession in Angola.

Estimated gold output of the new Free State mines will increase by 60% during this year and by December will be around 250,000 oz a month. This will be roughly one-quarter of the present rate of production of the 44 gold mines of the Transvaal. It is also estimated that the value of gold produced during this year will be in excess of $515-million and uranium near $85-million. Value of all mineral production last year was approximately $650-million, compared with $265-million in 1938.

March gold output for South Africa is reported likely to be the highest monthly figure for 12 years. Total tonnage milled by the large mines was 5,575,600 tons and working profits from gold amounted to $10.5-million. Jump was due to the long working month and the effects of the sharp increases in supplies of African labor in recent months. Provision of more power is helping all mines. Uranium profits also continued to rise satisfactorily, with Randfontein Estates showing an estimated profit of nearly $850,000.

Sequel to the decision of the Freddies Consolidated Mine in the Free State to suspend operations in the southern section of the property has been the purchase of their No. 2 shaft together with 1,300 claims by the neighboring property, Free State Geduld, for approximately $4.2-million. Acquisition of the shaft means that Geduld will be able to connect with it, improve ventilation and investigate the northern section of its own ground.

RIBLET
AERIAL TRAMWAYS

Any Type
All Capacities

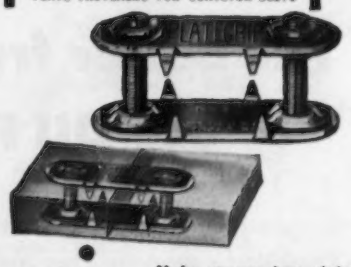
A Riblet Aerial Tramway will carry your ore, concentrates, coal or waste over any terrain economically and dependably.

Low cost per ton through any weather with a Riblet Automatic System.

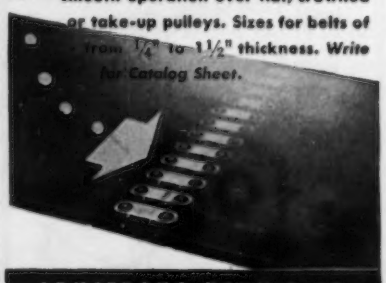
Consult versatile specialized designers of Aerial Tramways.

RIBLET TRAMWAY CO.
Box 7, Sta. A, Spokane, Washington
57 Years of Experience

PLATEGRIP
PLATE FASTENERS FOR CONVEYOR BELTS



Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from 1/4" to 1 1/2" thickness. Write for Catalog Sheet.



ARMSTRONG BRAY & CO.
5322 Northwest Highway, CHICAGO 30, U. S. A.

Shown being used in a narrow mine shaft, the Worden Gravity Meter is ideally suited for gravity work in hard-to-reach locations where small size and light weight are important.

Below ground you get best results with the WORDEN GRAVITY METER

Reduce mining exploration costs with the Worden Gravity Meter — world's smallest precision instrument for accurate gravity measurement. Manufactured exclusively by Houston Technical Laboratories, the lightweight Worden Meter (5⅛ lbs.) accurately pin-points gravity anomalies. Indicating variations in mass, these anomalies help delineate mineral beds, greatly reducing the amount of diamond drilling and crosscutting necessary for exploration.

Requiring no external power source, the sealed, self compensating Worden Meter has the portability vital for fast, economical mining surveys. Reading accuracy of the Worden Meter is 0.01 milligal.

Worden Gravity Meters may be leased or purchased from HTL. Write for Bulletin GM-201.

HTL

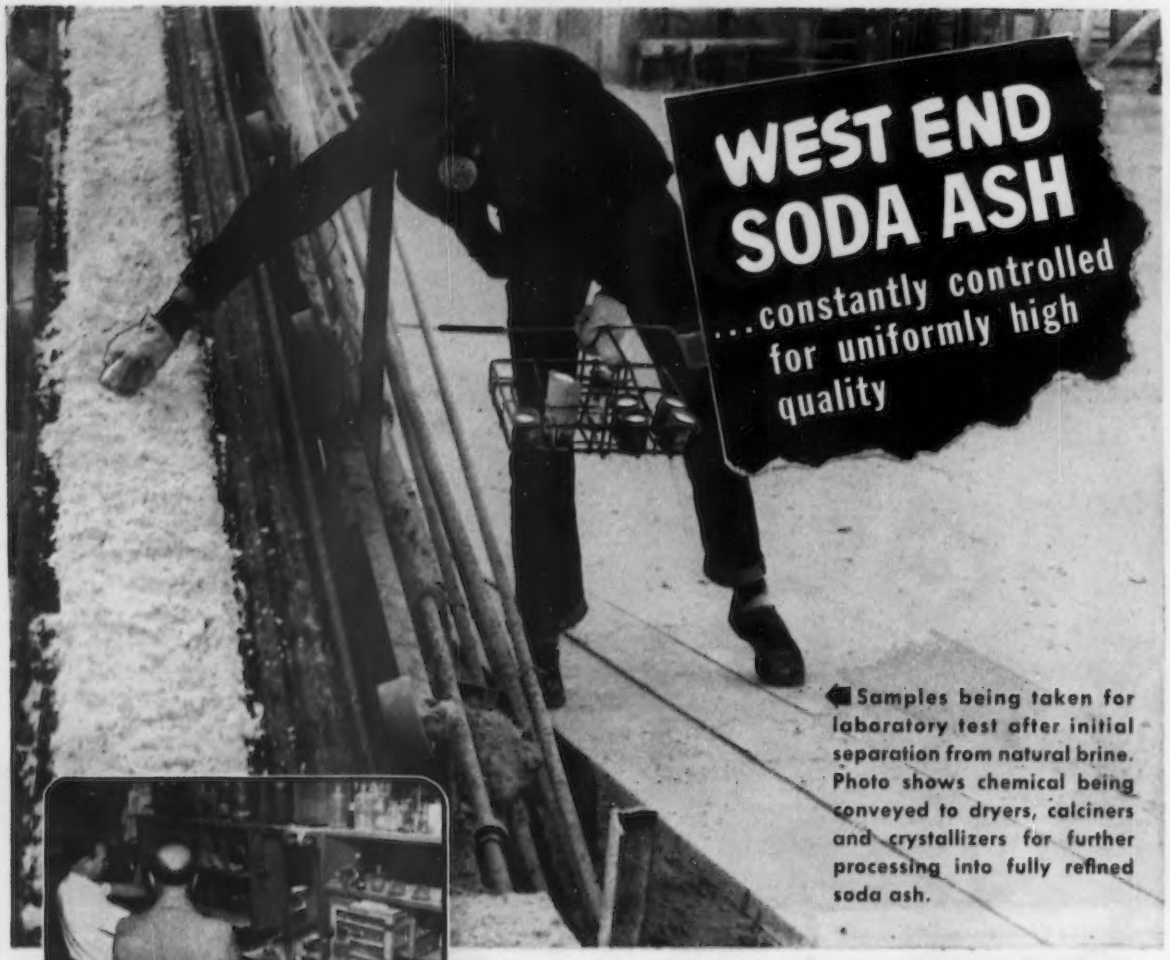
HOUSTON TECHNICAL LABORATORIES

A SUBSIDIARY OF TEXAS INSTRUMENTS INCORPORATED

2424 BRANARD • HOUSTON 6, TEXAS, U.S.A. • CABLE: HOULAB

WEST END SODA ASH

...constantly controlled for uniformly high quality

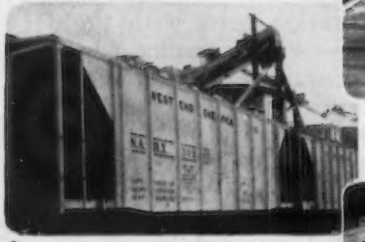


Samples being taken for laboratory test after initial separation from natural brine. Photo shows chemical being conveyed to dryers, calciners and crystallizers for further processing into fully refined soda ash.

Many laboratory tests are made of the product during chemical processing from natural brine to finished soda ash.

West End is a pure white, free-flowing and rapidly soluble soda ash that produces a far cleaner, more uniform product. In continuous production, it is available at all times in fully adequate quantities for the normal and emergency needs of western customers. Fast, economical transport by rail or truck to any point in the West.

PERSONAL SERVICE — Customers anywhere in the West are only a few hours away by company plane.



IMMEDIATE SHIPMENT to customers throughout the West in company's own leased hopper cars . . . ready at all times.

30 MINUTE IN-AND-OUT LOADING for bulk trucks at any hour of day or night through "serve yourself" delivery.

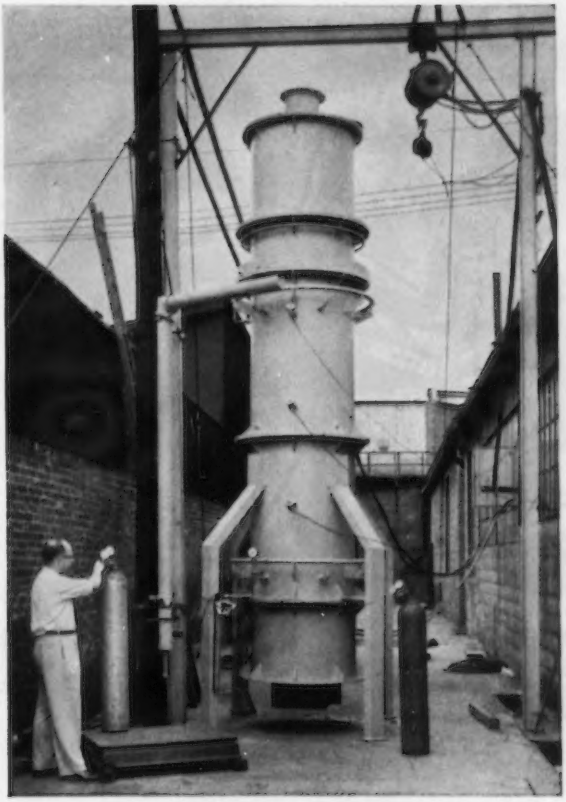
WEST END CHEMICAL COMPANY

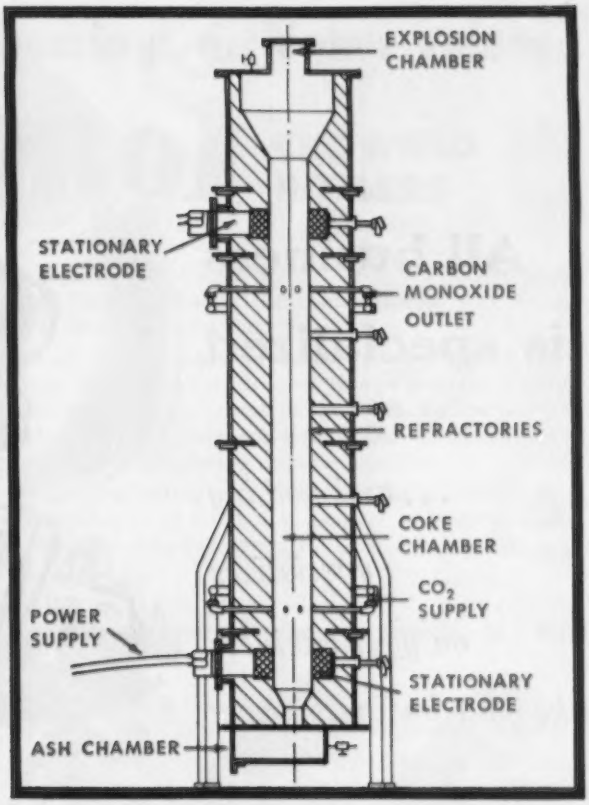
SODA ASH · F. M. SMITH BRAND BORAX · HYDRATED LIME

Write for samples, prices and technical data.

West End Chemical Co.

Executive offices: 608 Latham Square Building, Oakland 12, California · Plant: Westend, California





CAN YOU USE SOMETHING LIKE THIS?

...for gaseous reactions using a conducting medium

This Lectromelt* Reactor was built for converting carbon dioxide to carbon monoxide continuously, on a pilot basis. The CO_2 is fed into the manifold near the bottom; it passes up through a column of heated coke where it is transformed into CO. This is taken off through the upper manifold.

This reactor offers these advantages over previous similar equipment: The ring electrodes should last for many months, since they are always under an atmosphere of dead gas. Because this vessel is gas-tight, it can be used on a batch basis for processes requiring pressure.

Where can you use it?

Carbonaceous reduction, calcining, chlorinating of titanium—these are a few of the applications suggested for this reactor. You give us your ideas. Lectromelt engineers have been dealing for years in problems of electrothermic reduction. Describe your problem and they'll help you solve it.

Whether you're expanding accepted processes or developing something new, we'll be interested in talking with you. Outline your thinking to Pittsburgh Lectromelt Furnace Corporation, 322 32nd Street, Pittsburgh 30, Pennsylvania.

Manufactured in... GERMANY: Friedrich Kocks GMBH, Dusseldorf... ENGLAND: Birlec, Ltd., Birmingham ... FRANCE: Stein et Roubaix, Paris ... BELGIUM: S. A. Beige Stein et Roubaix, Bressoux-Liege ... SPAIN: General Electrica Espanola, Bilbao ... ITALY: Forni Stein, Genoa. JAPAN: Daido Steel Co., Ltd., Nagoya

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

All business is specialized

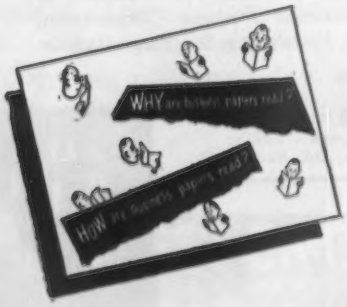
.... and nothing specializes on your business like your business paper

You can sell suntan lotion on Broadway or Beacon Street, but this seagoing salesman can sell a whale of a lot more . . . because he *specializes.*

Your business is specialized, too. That's why it pays to keep up with your business paper. It specializes on business problems you meet every day. It helps you do a whale of a lot better job by keeping you posted on your whole field. You can *move ahead* when you know what's ahead; you can make quicker, surer decisions when you have a clear perspective on what's happening; and you get all this from your business paper.

Every page counts. The editors gather facts, weigh and interpret them. The advertisers line up new products, materials and equipment . . . tell you what they do and where to buy them. To know what's new that's important to you, read *every* issue—thoroughly! It will keep you one of the best informed people in your field.

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a paid circulation paper that must earn its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd St., New York 36, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

Now...load rate your bearings at higher values

with Tru-Rol CROWNED ROLLERS

Greater capacity . . . longer life . . . or a precisely balanced gain of *both* factors. That is the choice offered you by the "crowned" rollers of Tru-Rol bearings.

By finish grinding a carefully selected crown radius on roller ends, Rollway relieves high stress areas, insures uniform distribution of load over the entire length of the roller. Rollers can take heavier loads without excessive end-fatigue, and are less subject to the effect of slight misalignment or deflection.

The result is load rating at higher values for greater capacity, longer service life . . . or both. If this choice interests you, why not write for the complete story. Rollway Bearing Co., Inc., Syracuse, N. Y.

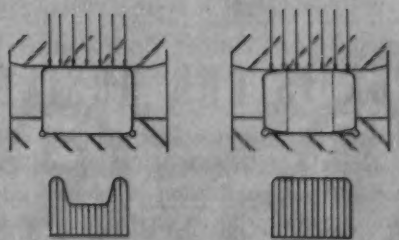
Tru-Rol Bearings with crowned rollers are available in 3 types

Stamped Steel Retainer with Guide Lips

Segmented Steel Retainer

Full Roller

Comparative Stress Patterns under Uniform Loads for Straight and Crowned Cylindrical Rollers



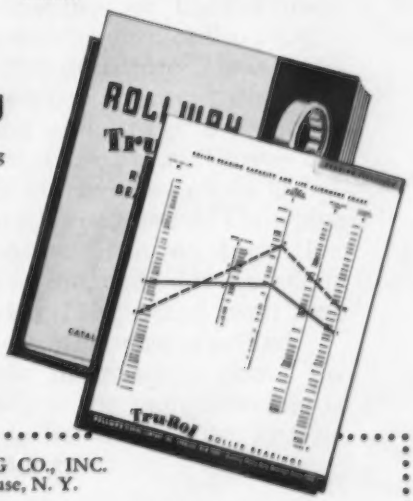
Stress pattern for a straight cylindrical roller under load. Note uneven end-loading.

Stress pattern for crowned roller under load. Crowning radius is exaggerated for clarity.

FREE New Catalog

features RBEC* bearing selection formula converted to simple nomograms! Send for a copy today.

*Roller Bearing Engineers' Comm. — Anti-Friction Bearing Mfrs. Assn.



ROLLWAY BEARINGS

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

ROLLWAY BEARING CO., INC.
565 Seymour St., Syracuse, N. Y.

Please send free copy of your new Tru-Rol Catalog with extra Alignment Charts.

Name_____ Title_____

Firm Name_____

Address_____

City_____ Zone_____ State_____

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronto • Pittsburgh • Cleveland • Milwaukee • Seattle • Houston • Philadelphia • Los Angeles • San Francisco

HOW ARE YOUR COMMUNICATIONS ?

Do the booklets, pamphlets, and manuals you use really *work* for you? Are these vital publications, that tell the story of your products and your company, as effective, readable, well designed and illustrated as they can be? Today more than ever, your entire operation is judged by each annual report, employee manual, and public relations piece that you produce. Have you examined your communications lately? If you have any doubt as to the impact of your instructional and promotional literature, remember . . .

COMMUNICATION IS OUR BUSINESS

For a good many decades McGraw-Hill has stood for complete coverage in the business literature field. Now the McGraw-Hill TECHNICAL WRITING SERVICE offers a new approach to your publication problems – an *integrated* writing, editing, illustrating, and printing service for the *custom* production of: INSTRUCTION MANUALS, PRODUCT BULLETINS, TRAINING AIDS, INDUSTRIAL RELATIONS LITERATURE, ANNUAL REPORTS, COMPANY HISTORIES, PROCEDURAL GUIDES and other collateral literature. More than 150 editorial and graphic experts are at your disposal, ready to prepare high-quality material to your own or government specifications. Save time, save money . . . and make your communications work! Let *our* staff be your staff for technical and business publications.

McGraw-Hill Book Co. TECHNICAL WRITING SERVICE

Write or phone Technical Writing Service, McGraw-Hill Book Co., Inc.
330 West 42nd Street, New York 36, N. Y. • LOngacre 4-3000

This service is available through ad agencies.

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . . Made in a complete line. Sizes from ½" to 30" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

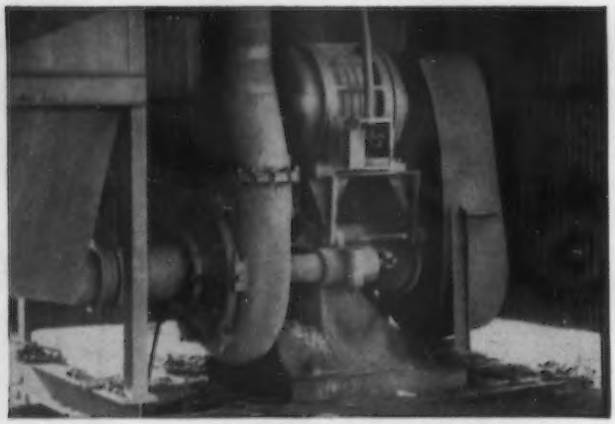
For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

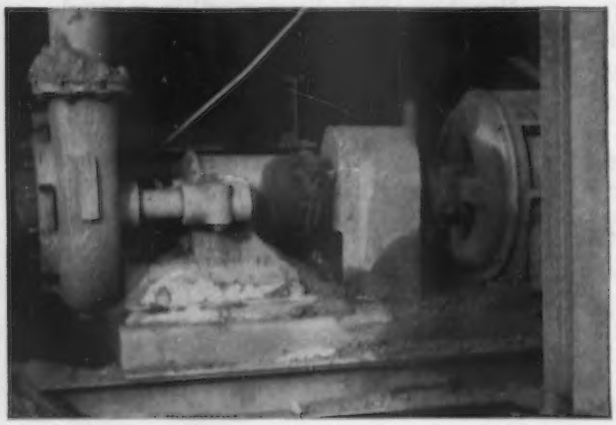
60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



Located at a wash plant in northern Minnesota, this 10" Amsco Pump handles tailings of 15-20% solids under a head of about 70 feet.

This 10" Amsco Pump is located in a heavy media plant in northern Minnesota. It handles tailings with 25% solids under a 32-foot head.



This 6" Amsco Pump handles tailings of about 30% solids against a head of 45 feet in a heavy media plant on the Iron Range in northern Minnesota.

AMSCO® Pumps job-rated to last longer

When you're pumping punishing materials such as abrasives or heavy solids, get an Amsco Pump—designed with selected alloys for tough pumping jobs.

Every tough pumping problem has its own operating requirements. And, here's where an Amsco Pump specialist can help you. With experience gained in many different installations, an Amsco engineer will analyze your operation and recommend the type of Amsco Pump best suited for your application. And he'll follow through during every phase of installation and initial operation to be sure you're getting full pump efficiency.

Standard size Amsco Pumps range from 6" to 20" discharge openings. Larger sizes are also available. Write for Bulletin No. 548IP which gives specifications and complete data on the Amsco Pump line. Amsco also manufactures a complete line of hardfacing welding equipment . . . both rods and machines.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

Here's the lowest cost

TRAMP METAL PROTECTION

ever offered...

...It's the New

DINGS

"Universal Series" METAL DETECTOR

The new Dings Universal Series Metal Detector will detect the presence of all magnetic metals in materials that pass through the Detector Search Coil. Metals are thus detected in material in any form, whether in raw or finished conditions, in bulk or pressed form, liquid or viscous, granular or fibrous state. Even weakly magnetic metals such as manganese steel can be detected by this new, adjustable intensity unit.

Extremely simple in design, installation and operation, the new Dings Metal Detector requires virtually no attention. It is merely necessary to plug the unit into any single phase outlet, place the Search Coil around conveyor belt, and turn on the switch . . . and you have provided protection against tramp metal damage to machinery and product quality at an extremely low cost.

DINGS ELECTRONICS, INC.
(subsidiary of DINGS MAGNETIC SEPARATOR CO.)
4716 W. Electric Ave., Milwaukee 46, Wisconsin

HERE ARE SOME OF ITS OUTSTANDING FEATURES

- Wide range of sensitivity settings
- Responds to manganese steel
- Remote location of control cabinet (30-ft. of cable furnished)
- Permanent stability (no adjustments necessary — not subject to temperature or humidity changes)
- Rubber-mounted search coil completely water-tight
- Control relay inside cabinet (for actuating alarm systems, reject devices, motor starters, etc.)
- Low power consumption
- Easily installed and operated, even by inexperienced personnel

Dings

Magnetic Separation Leader for over 50 years

MAIL THIS COUPON NOW

DINGS ELECTRONICS, INC.
4716 W. Electric Ave., Milwaukee 46, Wisconsin

Please rush further details about the new Dings Universal Series Metal Detector.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

MD155

FOR HIGHER TONNAGES

AND LONGER LIFE IN TOUGH SERVICE...

BIRDSBORO-Buchanan

DEEP FRAME JAW CRUSHERS

PATENTED

Designers and Builders of:

STEEL MILL MACHINERY
HYDRAULIC PRESSES
CRUSHING MACHINERY
SPECIAL MACHINERY
STEEL CASTINGS
Weldments "CAST-WELD" Design
ROLLS: Steel, Alloy Iron, Alloy Steel

The high tonnage crushing you get from Birdsboro-Buchanan Jaw Crushers stems directly from the DEEPER Frame and LONGER Swing Jaw. These features provide the DEEP crushing chamber to assure positive nipping action which minimizes slippage and results in a higher ratio of reduction and greater capacity with lower maintenance cost. These features also make possible greatly increased jaw plate, toggle and bearing life.

These all cast steel patented crushers are available in a full range of sizes from 24″ x 36″ to 66″ x 84″, to suit any plant design. For help on your primary crushing problems, get in touch with Birdsboro.

CR 4-55

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA. Offices in Birdsboro, Pa. and Pittsburgh, Pa.

A JEFFREY FAN FOR EVERY MINE JOB . . .

for heavy duty up to 13" W.G. pressure

This western mine installation is the 12A Series AERODYNE — a 12-blade, self-contained deluxe fan designed for maximum pressure of 13" W.G. and volumes from 20,000 to 700,000 C.F.M. Features include individual, positive blade adjustment and custom-made pillow block which has internal circulating oil lubrication, with ample radial loaded spherical roller bearings and separate end thrust ball bearing. For heavy duty, Jeffrey also builds the most popular mine fan in America, the 8H Series AERODYNE. The 8H can blow or exhaust from 20,000 to 500,000 C.F.M. of air at pressure up to 20" W.G.

for medium duty up to 5" W.G. pressure

Economy and efficiency are combined in the Jeffrey 6F Series AERODYNE engineered for medium duty general mine ventilation. Six universally adjustable blades made of cast-aluminum alloy give the 6F wide adaptation to changing conditions. Another low cost fan for intermediate duty is the Jeffrey AERODYNE Jr., with capacity of 5,000 to 150,000 C.F.M. up to 4" W.G. pressure.

for ventilating single drifts

In exploration mining no fan beats the Jeffrey 5 H.P. AERODYNE Midget for blowing or exhaust through tubing. This sturdy, self-contained fan has free delivery volume of 6200 C.F.M., 6.5" Maximum Static Pressure. It's a low-height, light-weight unit, easily portable from place to place. Also for light duty ventilation: Jeffrey 1½ H.P. Midget Blowers, Type 61 Blowers and Universal Blowers.

Write Mining Sales Division for more information

THE JEFFREY MANUFACTURING CO.

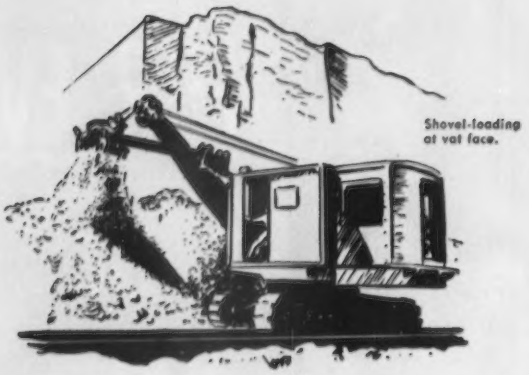
ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!



Shovel-loading at vat face.

Crude Sulphur

for Industrial Use

from the properties of

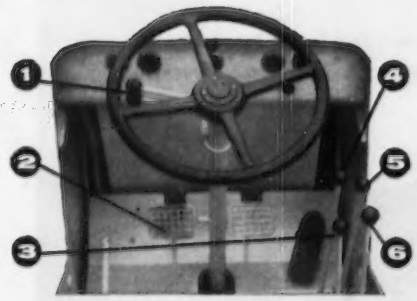
Texas Gulf Sulphur Co.

75 East 45th Street • New York 17, N. Y.

Producing Units

- **NEWGULF, TEXAS**
- **MOSS BLUFF, TEXAS**
- **SPINDLETOP, TEXAS**
- **WORLAND, WYOMING**

Faster, more power,
and LOOK, NO CLUTCH!



It's a pleasure to work here!

1. **Power-shift levers:** for Forward-Reverse and High-Low; make any shift while moving in either direction.
2. **That's no clutch!** It's a double-pedal brake, use it with either foot.
3. **Break-out bucket lever:** work the bucket in the pile—you've got two big double-acting bucket cylinders for tremendous breakout power, independent low-level tip back.
4. **Range Shift:** working or travel speed
5. **Drive Selector:** 4-wheel and 2-wheel
6. **Boom Control**

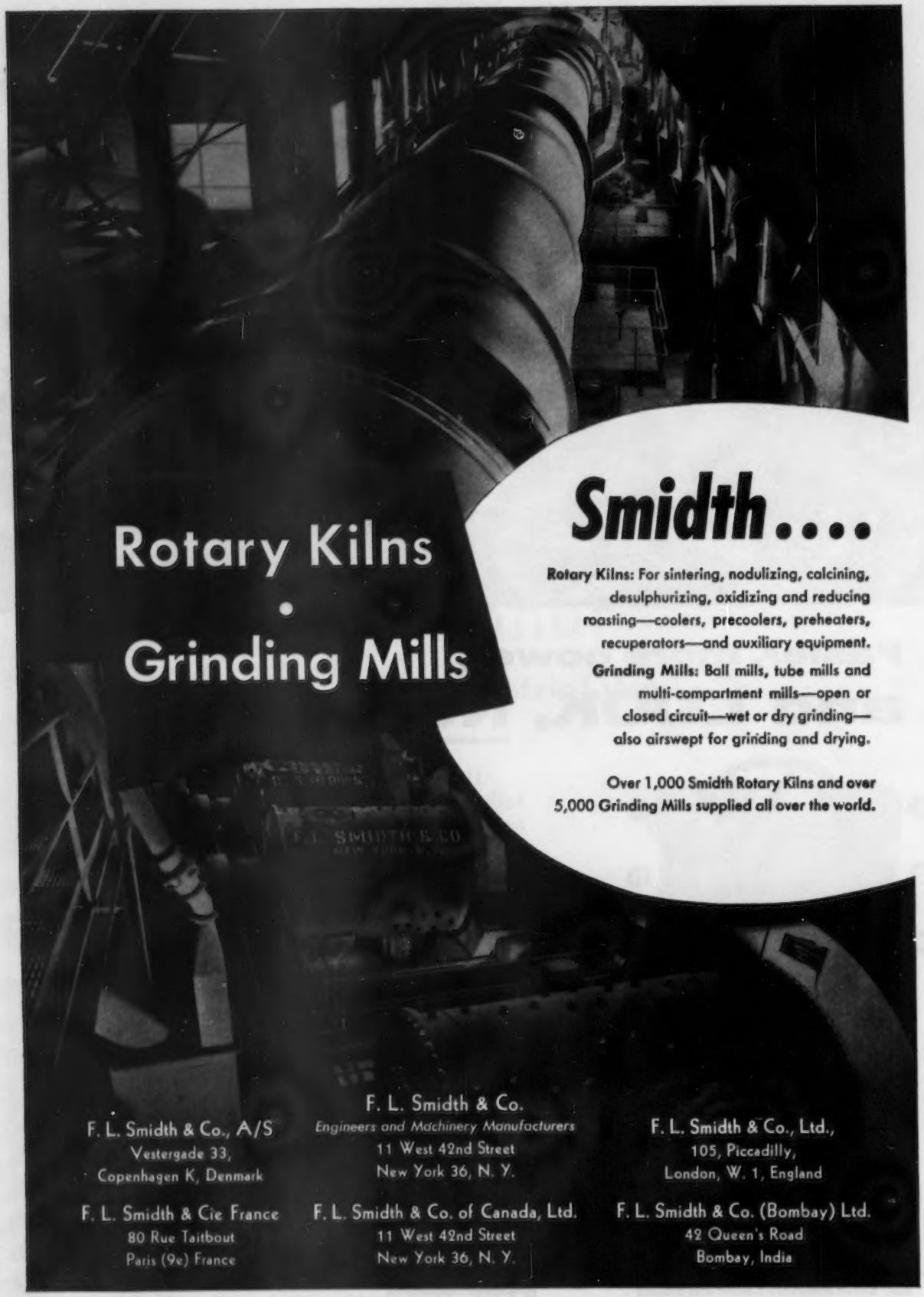
Until you see a MICHIGAN in action, you won't believe that it's possible to deliver so much power with such ease of operation. Your driver stays at peak efficiency all day long because there's no conventional clutch on a MICHIGAN. Instead, the MICHIGAN's exclusive power-shift transmission does all the shifting hydraulically—and eliminates the most notorious cause of excessive maintenance and driver fatigue.

In addition to effortless, instantaneous shifting, you get up to 300% torque multiplication on a MICHIGAN —from the Clark-built converter. With this kind of smooth, shockless power transmission, you get the full advantage of the MICHIGAN's extra weight and higher horsepower.

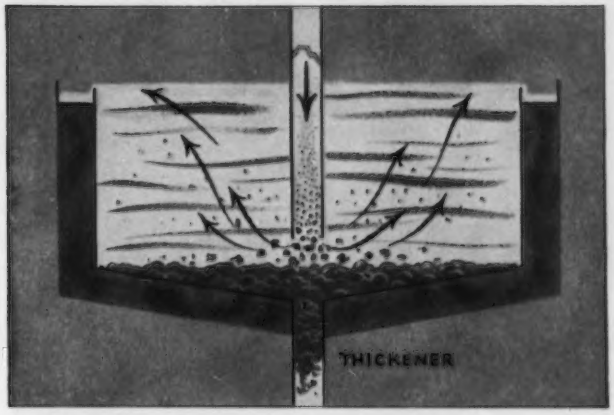
A demonstration (on your own job, if you wish) is the only way to get a real understanding of what this machine can do! Just write or call us—and don't forget that all MICHIGAN's are available on the low-cost MICHIGAN Lease Plan.

CLARK EQUIPMENT

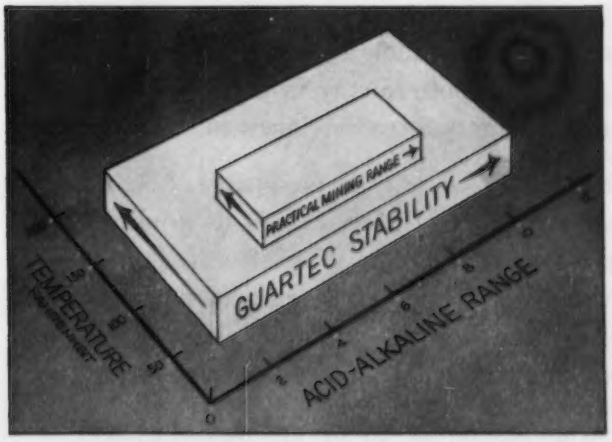
CLARK EQUIPMENT COMPANY
Construction Machinery Division
436 Second St., Benton Harbor 28, Michigan
Phone: WA 6-6184


Rotary Kilns
•
Grinding Mills
Smidth....
Rotary Kilns: For sintering, nodulizing, calcining, desulphurizing, oxidizing and reducing roasting—coolers, precoolers, preheaters, recuperators—and auxiliary equipment.
Grinding Mills: Ball mills, tube mills and multi-compartment mills—open or closed circuit—wet or dry grinding—also airswept for grinding and drying.
Over 1,000 Smidth Rotary Kilns and over 5,000 Grinding Mills supplied all over the world.
F. L. Smidth & Co., A/S
Vestergade 33,
Copenhagen K, Denmark
F. L. Smidth & Co.
Engineers and Machinery Manufacturers
11 West 42nd Street
New York 36, N. Y.
F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England
F. L. Smidth & Cie France
80 Rue Taitbout
Paris (9e) France
F. L. Smidth & Co. of Canada, Ltd.
11 West 42nd Street
New York 36, N. Y.
F. L. Smidth & Co. (Bombay) Ltd.
42 Queen's Road
Bombay, India

Now—Faster Settling in the Thickener with GUARTEC



Faster Settling in the thickener is one of the big advantages that Guartec can offer your refining operations. Guartec, with 5 to 8 times the settling action of starch, quickly agglomerates fine particles and settles them to the bottom, as shown above. There they form a loose mass that can be drawn off easily without blocking the outlet.



Wide Stability is a strong feature of Guartec for mineral operations. As the graph above shows, Guartec operates effectively in a pH range of 1.2 to 11 and flocculates at temperatures of 40 to 180° F. It is available in commercial quantities packed in 100 pound bags lined with moisture-protective pliofilm.

New Vegetable Gum Colloid Available in Commercial Lots

General Mills' new Guartec—a natural gum colloid of the guar seed settles ore and other solid particles faster and more uniformly than most flocculants. Many operators find that Guartec:

1. **Improves mineral recovery**
2. **Cuts settling time**
3. **Speeds tonnage production rate**
4. **Permits greater production with same equipment**
5. **Cuts the frequency of plant "down" time**
6. **Features wide stability**
7. **Is effective under varied conditions**

GUARTEC USES

Guartec is used in thickeners to "floc" slimes from uranium, zinc, iron ore, and manganese. It can clarify brines in potash refining, conserve water for re-use in iron ore processing, and perform many other flocculating jobs.

GUARTEC AMOUNTS

Mere "trace" amounts of Guartec will help you solve your settling problems. As little as 0.1 pound of Guartec (about 3¢) per 1,000 gallons of slime speeds settling in thickener or tailings pond. You get more tons of refined ore, faster, with the same equipment . . . and with no danger of losing fine ore values to thickener overflow.

Besides its settling action, Guartec also works well as a flocculant for filtering, and as a blinding agent to save on expensive collectors in froth flotation.

Try Guartec. See for yourself how it benefits your beneficiation. Send for your Guartec sample and literature, today.

For sample, prices and technical information, write to . . .

General Mills

Special Commodities Division

400 Second Avenue South
Minneapolis 1, Minnesota

Check Up On Grinding Ball Performance . . . Do You Have The Best Ball In Play?

Ask the "Ump" why he doesn't allow a scuffed, out-of-round baseball or one with soft spots to stay in play. He'll tell you it handicaps the batter and is a detriment to the game.

In leading mills around the world there are plenty of buyers who will tell you that Sheffield Moly-Cop Balls grind out the lowest cost-per-ton-unit ground. Why? Because of the exceptionally fine balance of toughness and deep hardness, Moly-Cop Grinding Balls keep their shape longer—grind out savings by reason of longer, uniform wear.

A Sheffield man stands ready to demonstrate this in your mills under your own particular grinding conditions.

SHEFFIELD
ARMCO
MOLY-COP
COPPER-MOLYBDENUM-ALLOY
Grinding Balls
product of over 25 years of "Know How."

SHEFFIELD STEEL
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON KANSAS CITY TULSA

Export Representatives: **ARMCO INTERNATIONAL CORPORATION** Middletown, Ohio

Carbon and Alloy Steel • Ingots • Blooms • Billets • Plates • Sheets • Hot Rolled Bars • Steel Joists
Structural Shapes • Reinforcing Bars • Welded Wire Fabric • Wire Products • Wire Rods • Fence
Spring Wire • Nails • Rivets • Grinding Media • Forgings • Track Spikes • Bolt and Nut Products.

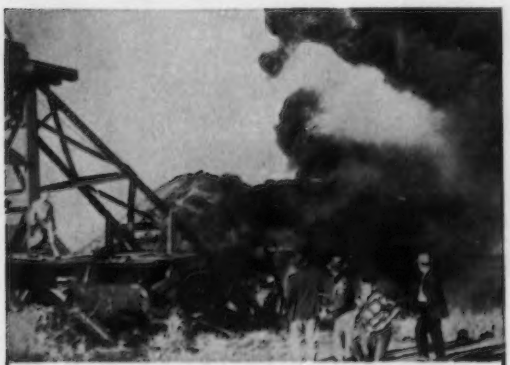
*Note extremely rugged conditions in this photo, showing bottom loading conveyor system in British coal mine. Inset shows roll of SCANDURA.

For **FIRE SAFETY,** Long Life and Economy —

NEW **SCANDURA**

The original P. V. C. coated conveyor **BELTING**

You want *extraordinary resistance* to wear and tear with top tonnage hauls—and you get it with SCANDURA. But even more, you want *fireproof conveyor belting* that eliminates one of the great hazards of mining—fire caused by friction when your conveyor belt slips or stalls.



LET'S LOOK AT THE RECORD!

About 12% of coal mining fires in the past several years have been attributed to conveyor-belt friction.

At the 1953 annual meeting of the Illinois Mining Institute, data was presented to show that the majority of belt fires result from stalled belts while the driving pulley continues pulling.

In the tragic Evanston, Ky. fire in which 4 men lost their lives, fire was reported to have had its origin in the friction caused when a fall stopped the belt, while the drive motor continued to operate.

This record clearly points to the great need for SCANDURA BELTING!

SCANDURA, developed by our parent company, and now being manufactured in our Charlotte, N. C. plant, has these unique features:

- *Withstands abrasions that would ruin other belts.*
- *Exceptionally tenacious in holding fasteners.*
- *Solid woven base with covers that will not strip, gouge or "dog ear".*
- *Not affected by water, dilute acids, alkalis, salt solutions, etc.*
- *Non-inflammable, mildew and rot-proof.*
- *Works in temperatures ranging from 22° below to 212° above.*
- *Can be made in widths from 1" to 42" and thicknesses from ⅛" to ⅜".*

SCANDURA has been tested and used with gratifying results in Britain since 1946. For safety and economy, it's in a class by itself. Write, wire or telephone for complete data.

SCANDINAVIA BELTING COMPANY
250 CENTRAL AVENUE, NEWARK 1, N. J.
BOSTON • PLANT: CHARLOTTE 1, N. C. • CLEVELAND

AERIAL AND GROUND EXPLORATION FOR URANIUM AND OIL

with the finest
Scintillation Detector System *ever built!*

Radioactive anomalies caused by uranium or oil deposits are accurately detected and instantly recorded in the air or on the ground with the *NEW* DS-7 survey system.

Extremely High Sensitivity—3 inch sodium iodide crystal; 3 inch phototube; greater than 1 million cpm in a 1 mr field.

Rugged Construction—all units thermal insulated and shock mounted; Phototube and Crystal *triple* shock mounted.

Completely Moisture Proof—circuits operate indefinitely at 100% humidity.

Maximum Flexibility—separate units easily adaptable to various installations.

Low Power Consumption—*only* 65 watts.

Light Weight—approximately 75 lbs. total weight.

The Nuclear-Chicago Scintillation Detector System is ideal for airborne or ground vehicle application. Write for full technical details with typical installation suggestions and exploration techniques, Bulletin "DS-7 Explorations."

nuclear-chicago
Nuclear Instrument and Chemical Corporation
233A West Erie Street, Chicago 10, Illinois

COLUMBIAN ALL-METAL BUILDINGS

Strong • Fire-Safe • Low Upkeep

Columbian All-Metal Buildings are increasingly popular with the mining industry because of their unlimited utility value—for warehouses, engine houses, dryhouses, shops, garages, compressor houses, etc. Prefabricated from quality steel. Sectional construction assures easy, low-cost erection. Exceptionally weather-tight. Rigid, strong, fire-safe. Minimum upkeep. Order from distributors listed below—or write direct for complete information.

COLUMBIAN STEEL TANK CO.
P. O. Box 4048-D, Kansas City, Mo.

Distributors in the United States

Denver Equipment Company
1400 Seventeenth Street
Denver, Colorado

Elmco Corporation
34 South 4th West Street
Salt Lake City, Utah

Distributors—Foreign

Avenida Ejercito Nacional 458-D Colonia Chapultepec Morales
Mexico, D.F.

A tip for top performance

TeeCee
TUNGSTEN CARBIDE

&

"TYPE L"
ONE PASS STEEL

LIDDICOAT

DETACHABLE
DRILL BITS

MANUFACTURED BY

Thompson Products

THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONT.

Double YOUR FOOTAGE

in the softer rock formations

The new CP-555's short over-all length permits set-up in restricted quarters.

Now, for the first time, you can have a fast and powerful rotary drill with an entirely independent rotary motor feed that affords full control at all times. And it's all combined in one compact machine – the new CP-555 Rotauger. Available for dry or wet drilling, it drills 2½ inch holes in speeds of 2 to 4 feet per minute in depths to 100 feet or more in gypsum, talc, medium limestones and other softer formations. For more information write for Bulletin SP-3110.

Chicago Pneumatic Tool Company, 8 East 44th St., New York 17, N. Y.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Ametron ELECTRONIC CRANE SCALE

Weighs heavy loads suspended from crane hook. Printer, located in crane cab or other convenient location, records weight on tape or cards. New compact printer only 22" x 18" x 10½". Entire assembly designed for prompt and easy installation.

Now available at new low cost. Capacities 5 10 15 tons

Write for free Ametron Brochure F-4

STREETER-AMET CO.

4101 N. RAVENSWOOD AVENUE
CHICAGO 13, ILLINOIS

Branches in Detroit, Pittsburgh, Allentown, Birmingham and Los Angeles

THE STANDARD OF ACCURACY SINCE 1888

DURIA HARD METAL

for Mining Tools
Cutting Tools
Drawing Die Industry
Wear Resistant Parts

The extraordinary fine and uniform grain structure of our Hard Metals guarantees longer tool life and high wear resistance.

DURIA

DURIA-WERK KARL KEMPF K-G.,
NEUSS/RHEIN

he's working for you

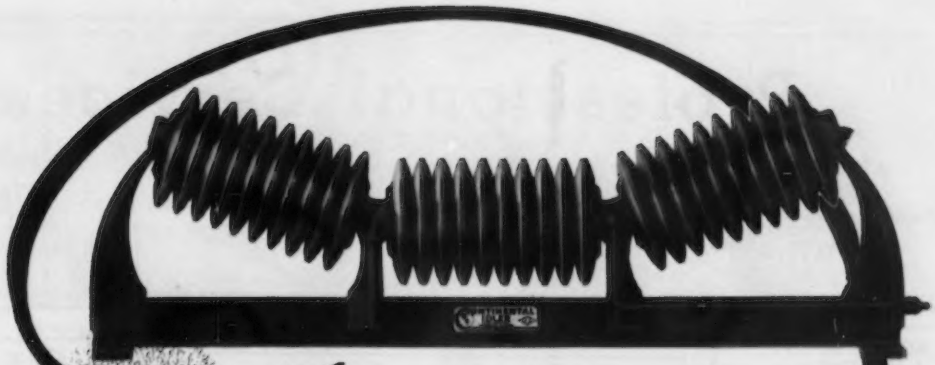
THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it"—"they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS



Continental IMPACT IDLERS — the BIG Difference...

In Conveyor Belt Life

Insist on Continental Impact Idlers under the loading point of your conveyors:

1. **Absorbs greater impact**
2. **Increases belt life**
3. **Lower belt maintenance**

Here's a typical installation that is really paying off—a Continental Shuttle Conveyor handling 600 TPH at 350 FPM. Systems such as this are constantly proving the value and reliability of Continental Conveyor Equipment.

Specify CONTINENTAL CONVEYORS

Write for your copy of Engineering Data Book ID-481-A "Continental Belt Conveyors"

CG-5201

INDUSTRIAL DIVISION

CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS — ATLANTA • DALLAS • KNOXVILLE • MEMPHIS — MANUFACTURERS

NEW YORK 17, NEW YORK

Professional Services

ASSAYING
CONSULTING
PROSPECTING
ORE TESTING

RESEARCH
METALLURGY
MILL DESIGN
MINE MANAGEMENT

AGENCE MINIERE & MARITIME S.A.
Sworn weighers, samplers & Assayers of Ores, Metals. Representatives of shippers at European ports & Works. *Market surveyors and commercial advisers assuring sales direct to consumers*
2, rue Van Bree, Antwerp, (Belgium)

Because the consultant gives an "outside viewpoint" and is free of the traditions and inhibitions which oftimes hamper the thinking of the men on the job, he is frequently able to see more clearly and offer valuable advice. Let him join your staff and demonstrate the practical dollars-and-cents value of an outside viewpoint.

LUCIUS PITKIN INC.
Mineralogists—Assayers
Chemists—Spectroscopists
SHIPPERS REPRESENTATIVES
Main Office—Laboratories
Pitkin Bldg.—47 Fulton St.
New York 38, N. Y.

BEHRE DOLBEAR & COMPANY
Consulting Mining Engineers and Geologists
11 Broadway, New York 4, N. Y.

HERON ENGINEERING CO.
Consulting Engineers for all types of Aerial Tramways, Cableways, and Suspension Structures
200 South Acoma St.
Denver 19, Colorado

E. J. LONGYEAR COMPANY
Geological and Mining Consultants
Exploration and appraisals of metallic and non-metallic mineral deposits
Photogeology
Foshay Tower Minneapolis, Minn.

SMITH-EMERY CO.
Assayers and Chemists
SPECTROGRAPHIC ANALYSES
781 E. Washington Blvd.
Los Angeles 21, Calif.

BLANDFORD C. BURGESS
Consulting Engineer
Industrial Mineral Specialist
USOM, APO 928
San Francisco, Calif.
Manila, Philippines Monticello, Ga.

HOPKINS EXPLORATION CONSULTANTS
607-320 Bay St.
Toronto 1, Canada
EM 4-5642, HU 9-3375

ROBERT S. MAYO
Civil Engineer
Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts. Special Equipment for Underground or Subaqueous Construction.
Lancaster, Penna.

ARTHUR R. STILL
Consulting Mining Geologist
24 Union Block — Phone 658
P.O. Box 1512
Prescott, Arizona

COWIN & COMPANY, INC.
Mining Engineers & Contractors
Shaft & Slope Sinking
Mine Development
Mine Plant Construction
1—18th Street S.W. Birmingham, Ala.
Phone 56-5566

KIRK & COWIN
Ralph E. Kirk Percy G. Cowin
Registered Professional Engineers
1—18th Street SW
Birmingham, Alabama
Phone 56-5566

ARNOLD H. MILLER
Consulting Engineer
General Mine, Mill and Industrial Appraisals
Plant Design, Mechanization and Improvement
Cable: "ALMIL." Tel. Cortland 7-0635
120 Broadway, New York 5

H. L. TALBOT
Consulting Metallurgical Engineer
Extraction and Refining of Base Metals
Specializing in Cobalt and Copper
Room 331, 84 State St.
Boston 9, Mass.

DICKINSON LABORATORIES
Assayers—Chemists—
Metallurgists—Umpire Work
Ore Shippers Representatives at Local Plants
Samplers - Analysts at Mexican Border Points
1300 West Main St. El Paso, Texas

KNOWLES ASSOCIATES
Chemical—Metallurgical—Mechanical *Engineers*
URANIUM ORE PROCESSING
Economic Studies — Mill Design
19 Rector St. New York 6, N.Y.

ARTHUR NOTMAN
Consulting Mining Engineer
56 Liberty St., 18th Floor
New York 5, N. Y., U.S.A.
Telephone BArclay 7-9484

GODFREY B. WALKER
Metallurgical Consultant
Mineral Dressing, Extractive Metallurgy
Heavy Media a Specialty
37 Lockwood Drive
Old Greenwich, Conn.

ABBOT A. HANKS, INC.
ASSAYERS—CHEMISTS
Est. 1866
Spectrographic Analysis
Shippers Representative
624 Sacramento Street
San Francisco 11

KELLOGG KREBS
Metallurgical Engineer
Mineral Dressing Consultant
564 Market St. Telephone:
San Francisco 4, Calif. SUtter 1-6613

RODGERS PEALE
Consulting Mining Geologists
315 Montgomery Street
San Francisco 4, Calif.

HARRY J. WOLF
Mining and Consulting Engineer
Examinations — Valuations — Management
One Park Place
New York 7, N.Y.
Cable: MINEWOLF
REctor 2-5307

E. LEE HEIDENREICH, JR.
Consulting Engineers
Crushing Plants Quarries
Milling Plants Plant Design
Plant Layouts Appraisals
75 Second St., Newburgh, N. Y.
9 Up. Clinton St., Chicago 6, Ill.

LEDOUX & COMPANY, Inc.
Metallurgical Chemists — Assayers
Spectroscopists
Representatives of Shippers of Ores and metals at Buyers Works
Mine Examination Analyses
359 Alfred Ave., Teaneck, N. J.

AMEDEE A. PEUGNET
Consulting Mining Engineer
Telephone MAin 1-1431
705 Chestnut St., St. Louis 1, Mo.

WORLD MINING CONSULTANTS, INC.
Consulting Mining Engineers and Geologists
220 Broadway, New York 38, N. Y.
WOrth 2-2934

PROFITABLE MINE OPERATION

Special Service for Either Foreign or Domestic Production

1. A careful detailed survey of your mining operation will be made by *mine production* specialist to determine the most efficient mining methods and machinery to be used.
2. We furnish and supervise all personnel to teach and instruct and carry out on-the-job training of labor in the efficient use of modern mining machinery.
3. This educational service provides demonstrators, teachers, helpers and management to produce high speed efficient mining operations. These picked teams of highly competent personnel will train your men in ways of mechanization anywhere in the world. We train native labor to use machinery.
4. We also contract for mining production—shaft sinking—development.

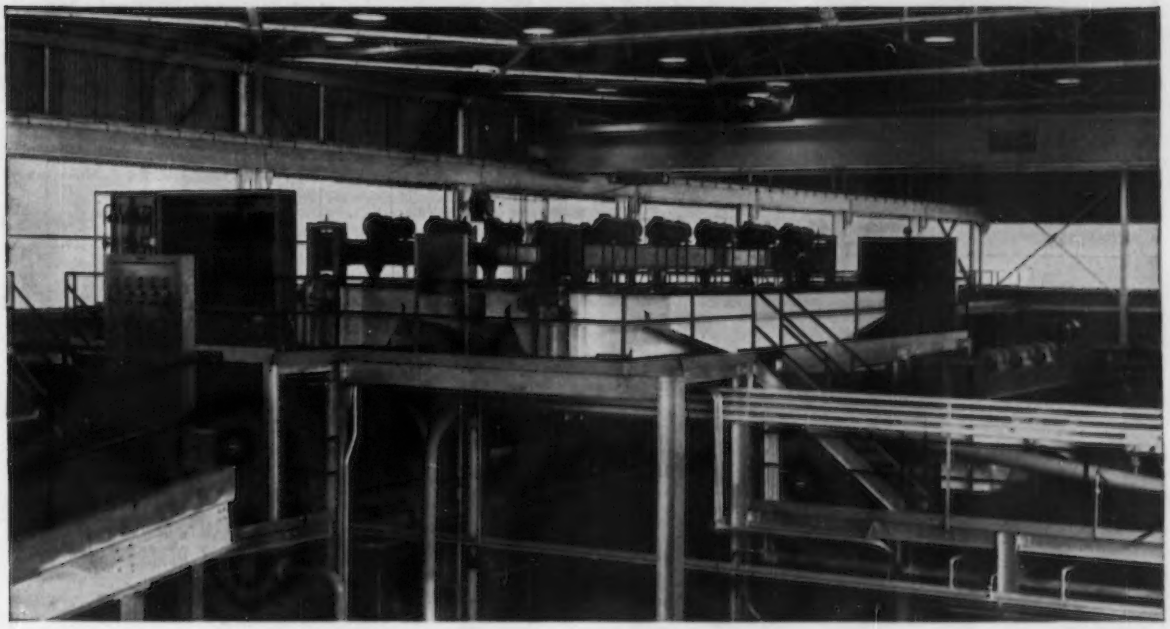
ROGER V. PIERCE
808 Newhouse Building, Salt Lake City, Utah

Turbo-Topics

TURBO-MIXER GENERAL AMERICAN TRADE MARK

TURBO-MIXER, a division of

GENERAL AMERICAN TRANSPORTATION CORPORATION



for help with minerals beneficiation and extractive metallurgy, see TURBO

Minerals beneficiation and extractive metallurgy methods are not new here! Turbo recommendations are based on actual production experience with units in continuous operation for more than 20 years.

Turbo specialists approach your individual needs from an engineering standpoint. Every factor bearing on maximum performance and minimum maintenance is tested extensively in our laboratory.

From the very beginnings of modern extractive metallurgy, Turbo-Mixer has been able to supply help to research and production teams.

Write for general bulletins and ideas in connection with: *Conditioning, flotation, storage of high solids pulps, leaching, repulping, autoclaving.*

SALES OFFICE: 380 MADISON AVENUE, NEW YORK 17, NEW YORK

General Offices: 135 S. LaSalle St., Chicago 90, Illinois • Offices in all principal cities

OTHER GENERAL AMERICAN EQUIPMENT:—DRYERS • DEWATERERS TOWERS • TANKS • PRESSURE VESSELS

introducing

NEW Hendrick Wedge Wire

Now! With the addition of new Hendrick Wedge Wire, Hendrick rounds out its line of screens for the best in efficient, low-cost screening, sifting, dewatering and filtering operations. Ideal wherever it's highly important for screen openings to be minutely fine, Hendrick Wedge Wire has excellent draining qualities and a high degree of accuracy and rigidity. For details on Hedrick Wedge Wire's free clearance, rugged mechanical and lateral strength, maximum load carrying capacity, percentage open area and long wearing life, contact your nearby Hendrick representative.

Hendrick
Manufacturing Company
70 Dundaff Street, Carbondale, Pa.

Sales Offices in Principal Cities

Perforated Metal • Perforated Metal Screens • Wedge Slot and Wedge Wire • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

designers and builders of equipment for basic industries

Car Feeders

EACH McNally Pittsburg car feeder has built into it accurate, fast control and rugged power for heavy duty, long-life service.

To Basic Industries
McNally Pittsburg Offers:

— SERVICES —
Research & Development
Engineering Design — Field Erection

— EQUIPMENT —

Roller Chain	Car Dumpers
Rotary Breakers	Car Hauls
Bucket Elevators	Conveyors
Pumps, Valves, Piping	Pug Mills
Dryers, centrifugal & heat	Crushers
Washers, automatic, heavy media & jig	Screens
	Kilns

McNALLY PITTSBURG
MANUFACTURING CORPORATION

— OFFICES —
First National Bank Bldg. Pittsburgh, Pennsylvania
307 N. Michigan Chicago, Illinois

— PLANTS —
Pittsburg, Kansas — Wellston, Ohio

GEIGER & SCINTILLATION COUNTERS

THE VERY BEST IN FIELD RELIABILITY, SENSITIVITY, LINEARITY, CONSTRUCTION, OVERALL PERFORMANCE

★ NEW URANIUM SCOUT Series Field Geiger Counters.
★ NEW Premium Scintillation Counters.
★ NEW Field Geiger Counter—Digit Scaler. Records Counts for 30 or 60 Sec Interval.

SEND FOR NEW 1955 CATALOG

FISHER RESEARCH LABORATORY, INC.
Dept. D
1967 University Ave. — Palo Alto, Calif.

ALLUVIAL DEPOSITS

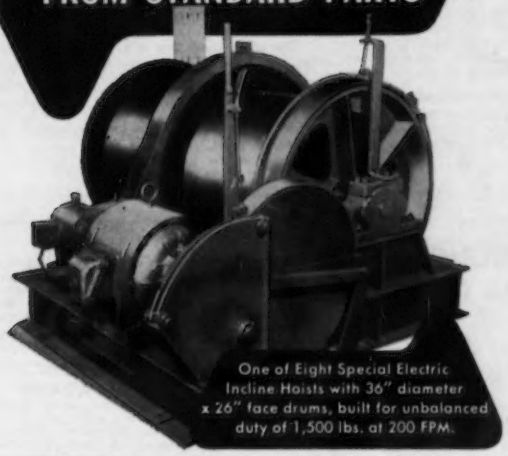
Gold Tin Columbite Titanium Bauxite

Most accurately and economically tested for . . . with the

EMPIRE DRILL

NEW YORK ENGINEERING COMPANY
75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

Special Hoists
FROM STANDARD PARTS



One of Eight Special Electric Incline Hoists with 36" diameter x 26" face drums, built for unbalanced duty of 1,500 lbs. at 200 FPM.

• By modifying and re-combining our standard parts, Superior-Lidgerwood-Mundy can engineer hoists to meet your specific requirements at the lowest possible cost.

WRITE FOR BULLETINS AND CATALOGS

SUPERIOR-LIDGERWOOD-MUNDY CORPORATION
Main Office and Works: SUPERIOR, WISCONSIN, U.S.A.
New York Office, 7 Dey Street, New York 7, N. Y.

P·P·T

1-50 HP
12-60" BELT
A.C.-D.C.

THIS IS IT!

THE SOLUTION TO YOUR CONVEYOR DRIVES

MOTORIZED HEAD PULLEY DRIVE

J.D.CHRISTIAN•ENGINEERS
480 POTRERO AVE., SAN FRANCISCO 10

CORE DRILLING
—anywhere!

"We look into the Earth"

- Mineral Prospecting
- Foundation Test Borings and Grouting
- Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.
DRILLING CONTRACTORS & MFRS.

1205 Chartiers Ave. PITTSBURGH, PA. WAlnut 1-5816

SEARCHLIGHT SECTION

MECHANICAL ENGINEER

Who has specialized in ball and tube mill application, to be associated with reliable manufacturer and to act as liaison between sales and engineering departments. Good salary and bonus to right man.

Write P-6188 Eng. & Mining Journal
330 W. 42 St., New York 36, N.Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

METALLURGICAL ENGINEER: Young, recent graduate who is interested in the beneficiation of non-metallic. Man selected will be in charge of control laboratory, responsible for operating metallurgy and direct testing and research. 1200 ton per day mill. Utilizing flotation. Location South. P-5837, Engineering & Mining Journal.

WE NEED two good sales engineers for ore dressing equipment. Operating experience with such equipment essential and some selling experience helpful. We manufacture and sell. We are known world wide and our increased business requires more, qualified men to help serve our customers. Salary plus incentive system, generous retirement and fringe benefits. Reply stating experience and availability. All replies confidential. P-5550, Engineering & Mining Journal.

Graduate Engineer to manage Mining Property producing two hundred tons per day, located in the Andes of Southern Peru. Must speak Spanish, preferably Latin-American operating experience. P-6207, Engineering & Mining Journal.

(Continued on following page)

PROCESS METALLURGIST

Process Metallurgist under 40 with 5 to 10 years experience in ore flotation field. For responsible position in separation and concentration of ores. Southeast U. S.
Your reply will be held confidential. Include age, education, experience, and salary requirement.

P6024 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

METALLURGIST
MINING GEOLOGISTS
MINING ENGINEERS

Applications are invited from graduates of a recognized University for responsible positions in Saudi Arabia.

Diamond Driller also required.

Applicants must have had a minimum of five years practical experience.
Salary to be offered will be commensurate with the qualifications and experience of candidates accepted.
Liberal travel and living allowances provided.
Two months' vacation upon completion of 18 month contract.
Applications stating age, marital status, qualifications, experience, and availability should be addressed to:

GENERAL DIRECTOR
PETROLEUM & MINERAL AFFAIRS
MINISTRY OF FINANCE
JEDDAH, SAUDI ARABIA

Graduate Mining Engineers

With 4 or 5 years varied experience are required by large, progressive, expanding, Copper Mine in the Copperbelt of NORTHERN RHODESIA.

Successful applicants will be given further experience in all phases of the mine technical and production departments including ventilation, draw control, survey, sampling, geology, planning and design, practical work on grizzleys, scraping, tramming, timbering and rock breaking, in order to fit them to progress to various responsible positions in the Mining Department. Basic salary will be dependent upon experience, but will not be less than £80 per month. There is in addition a variable Cost of Living Allowance at present amounting to £6.10.0d p.m., together with Pension, Life Assurance and Medical Schemes, in which the successful applicants will participate. There is also a Copper Bonus Scheme based on the prosperity of the Copper Mining Industry, which at present amounts to 60% on basic salary.

Leave would be initially at the rate of 43 days per year, and can be accumulated for three years. Single quarters only are available in the first instance, married accommodation being allocated on the basis of length of service. The waiting period for married accommodation is at present approximately one year.

Travelling expenses to Northern Rhodesia will be paid for successful applicants.

Applicants should submit details of age, qualifications, experience, marital status, availability and references to Box 564,

WALTER SKINNER LTD.
20 Copthall Avenue, London, England, E.C.2

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for Equipment Advertising)

$1.50 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)

POSITION WANTED undisplayed rate is one half of above rate, payable in advance.

PROPOSALS, $1.20 cents a line an insertion.

BOX NUMBERS count one additional line.

INFORMATION:

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EMPLOYMENT ADVERTISING:

New Employment Opportunities Section for Displayed ads starting July issue. For details see announcement ad in this section.

DISPLAYED RATE

The advertising rate is $13.80 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42 St., N. Y. 36, N. Y. For June Issue closing May 20th

OPENINGS AVAILABLE AT LONG ESTABLISHED MEDITERRANEAN COPPER PROPERTY

ASSISTANT CONCENTRATOR SUPERINTENDENT

Age limit about 45. Must be graduate metallurgist having operating experience and with aptitude and experience in laboratory research and process development. Heavy sulphide ore experience desirable. Qualified to succeed to superintendency.

ASSISTANT MINE SUPERINTENDENT

Age 30-42. Must be tactful and adaptable. Require man with excellent mining engineering training. Some operating experience necessary.

ASSISTANT CHIEF ENGINEER

Age limit 45 preferably about 35. Must be graduate mechanical, chemical or civil engineer with natural mechanical ability, excellent practical and supervisory and some construction experience, for charge under Chief Engineer of all shops, foundry, mobile equipment including loading, marine, railway and construction; maintenance and repair of all types of equipment; 7250 KVA diesel generating plant.

MINE MASTER MECHANIC

Age limit 48. Should be competent supervisor with practical ability required to operate local mine shops and surface equipment and to routinely maintain surface and underground equipment. Local facilities backed up by heavy duty general shops for major repairs.

LOADING SUPERVISOR

Age limit 48 preferably about 40. Should be seasoned foreman qualified and confident in dealing with labor and willing to work irregular and extra hours during rush periods. Experienced in supervising gangs of material handlers in shipping warehouses. Some equipment handling experience desirable. All products shipped by ocean vessels.

Forward with initial reply complete educational and experience records, list of references, age, marital status, number and age of children, photo (optional). Company offers three year contract, furnished house, transportation self and family, liberal vacations. Excellent climate, living conditions, medical and hospital facilities. School to 14 years. Non-contributory pension plan. Salary open.

P-6192 Eng. & Mining Journal
1111 Wilshire Blvd. Los Angeles, Calif.

TECHNICAL MINING PERSONNEL

Mr. Employer, YOU can receive nation-wide recruitment through Spokane's member of The National Association of Personnel Consultants at no charge to your firm.

ACME PERSONNEL SERVICE
Mining Department
P.O. Box 132, Spokane 63, Wash.

SOUTH AMERICAN POSITIONS OPEN

MECHANICAL ENGINEER with several years experience in actual supervision of large shops comprising machine shops, plate and welding shops, iron, steel and brass foundries.

DESIGN DRAFTSMAN for Mechanical Department's Engineering Office.

MINE LEVEL BOSS—graduate mine engineer.

ASSISTANT GENERAL SMELTER FOREMAN with good suitable technical education and all around smelter operating experience. Should have executive ability and be able to assume responsibility.

TRAINMASTER to coordinate all sections of Operating Division, including supervision of train crews, dispatchers, yard and station forces, car distribution, etc.

MAINTENANCE ENGINEER (OR MILL MASTER MECHANIC)—graduate Mechanical Engineer to take charge of all mechanical maintenance and repairs for all equipment throughout Concentrator Plant and operations. Should have good understanding of metallurgical processes and equipment.

Large Copper Company Chile, South America. 3-year contract. Transportation both ways and salary while traveling paid by Company. Good opportunities. In reply give complete details.

P 6063 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

COAL ASSOCIATION EXECUTIVE SALES ENGINEERING SERVICE

The National Coal Association is seeking an executive, a qualified engineer, to direct administrative and promotional activities in field sales engineering service in furthering the use of coal to industry. Must have experience related to the usage of coal, preferably in industry, an understanding and appreciatoin of the economics of coal, and possess a strong personal makeup. Ability to deal with people, develop selling programs, and plan and direct organizational efforts. Engineering degree preferred. Age 30-50. Growth opportunity. Compensation appropriate for a qualified man. Please send reply in detail in confidence to Market Promotion Committee.

P-6146 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

MINING ENGINEER

Young mining engineer interested in production work. Limestone mine in Central United States location. Experience not essential. Submit complete resume and salary requirement in first letter.

P-6316 Engineering & Mining Journal
330 W. 42nd St., New York 36, N. Y.

PUMP DESIGNER

Desired by West Coast manufacturer. Experience in sand pump design desired, but not required. Please submit complete resume of experience with samples of work. All replies will be answered in strict confidence. Our employees know of this advertisement.

P6526 Engineering & Mining Journal
68 Post St., San Francisco 4, Calif.

POSITIONS VACANT

(Continued from preceding page)

University of Alaska, School of Mines, College, Alaska, Department of Geology. Vacancy for permanent position to teach economic geology and allied courses. Ph.D. (M.S. may be acceptable) and teaching experience necessary. Rank and salary dependent on qualifications. Begin September, 1955. Contact Earl H. Beistline, Dean, School of Mines.

Wanted—Engineer, preferably mining engineer, for technical service. Work involves development, manufacture, sales, and use of commercial explosives. Location Southwest. Recent graduate or man with limited experience preferred. Submit resume to General Superintendent, Apache Powder Company, Benson, Arizona.

Graduate engineer thoroughly experienced open-cut mining preferably with Latin-American operating background needed for preparation estimates later operation location South America. Salary open. Send full professional record, salary desired, references P-6189, Engineering & Mining Journal.

POSITIONS WANTED

MINING ENGINEER, 25 years Successful and progressive Foreign and Domestic Mining Operations. Available as Manager or Superintendent. PW-1622, Engineering & Mining Journal.

Mining Geologist, 25, A.B., 1 year graduate study, 1½ years exploration experience in Southwest. Available June, married, one child. Prefer foreign assignment. PW-6346, Engineering & Mining Journal.

Metallurgical Engr., 30, M.S. Met. Engr., married, American, veteran, Bilingual (English-Spanish). Five years experience in copper smelter. Limited experience in steel mill. Thesis work concerned titanium extraction. Desires employment in metallurgical industry. Available, June 1955. PW-6321, Engineering & Mining Journal.

(Continued on opposite page)

Competent Mining Engineer and Mine Executive

Would like new employment. Minimum salary $12,000. Complete details on request.

PW-6320 Eng. & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

AVAILABLE MINE SUPERINTENDENT

Degree in geology, married, 41, 18 years' varied experience in underground and large open pit operations. Domestic and foreign, as technical and operating supervisor. Presently employed. Available as superintendent or manager in 6 mos. Prefers large-scale open pit operations.

PW-6196 Eng. & Mining Journal
68 Post Street, San Francisco, Calif.

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

BATTERY LOCOMOTIVES

1—2-2½ ton Whitcomb, 24" gauge
1—3½ ton Jeffrey, 36" gauge
2—3½ ton Mancha, 18"-32" gauge; with 2 sets Edison batteries
1—3½ ton Atlas, 24" gauge
1—4 ton Westinghouse, 24" gauge
1—4 ton Ironton, 36" gauge
2—6 ton General Electric
1—6 ton Mancha Trackmaster, 24" gauge, with 2 sets Gould KMZ-21 batteries
2—7 ton General Electric, 36" gauge, permissible
1—7 ton Atlas, 36"-48" gauge
2—8 ton General Electric, 36" gauge
2—8 ton Goodman, 36" gauge
3—8 ton Ironton, 24"-48" gauge
4—10 ton Atlas, 36" gauge

TROLLEY LOCOMOTIVES

1—4½ ton Goodman, 36" gauge
1—5 ton Jeffrey, 36" gauge
2—5 ton Jeffrey, 42" gauge
1—6 ton Goodman, 36" gauge
1—6 ton Goodman, 42" gauge
2—8 ton Goodman, 42" gauge
3—10 ton Jeffrey, 42" gauge
1—13 ton Goodman, 42" gauge
1—13 ton Jeffrey, 42" gauge
3—15 ton Jeffrey, 42" gauge

FILTERS

1—3' x 3' Oliver drum filter
2—4' x 8' Elmco drum filter
1—6' x 2' disc Oliver leaf filter
1—6' x 3' disc American leaf filter
1—18" Morse round pattern filter press
1—36" Merrill triangular filter press
1—#12 Sweetland filter press

DIAPHRAGM PUMPS

3—2" New Morse Diaphragm Pumps
2—4" New Morse Diaphragm Pumps
1—2" Dorrco Duplex Pump
1—4" Dorrco Duplex Pump
1—4" Barnes Pump
2—4" Butchart Pumps
1—4" Dorrco Pressure Diaphragm Pump

HOISTS

1—10 HP Vulcan #0 Single Drum
1—115 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Double Drum
1—30 HP Vulcan Single Drum
1—37 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—60 HP Fairbanks-Morse Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—375 HP Dillon-Box Single Drum
1—22 HP Vulcan #1½ Double Drum
1—60 HP Ottumwa Double Drum
1—150 HP Deweo Double Drum Hoist
1—40 HP American 3 Drum
1—80 HP Thomas 3 Drum
1—80 HP Lidgerwood
1—80 HP Clyde 3 Drum

CRUSHERS

4—2¼" x 3½" New Morse Lab Jaw Crushers
4—4" x 6" New Morse Lab Jaw Crushers
1—9" x 15" Wheeling Jaw Crusher
1—9" x 15" Farrell Jaw Crusher
1—8" x 24" Rogers Jaw Crusher
1—11" x 18" Universal Jaw Crusher
1—24" x 13" Farrell Jaw Crusher
1—10" x 16" Hercules Jaw Crusher
1—10" x 16" Universal #3M Jaw Crusher
1—26" x 18" Williams Hammermill

MUCKING MACHINES

2—Elmco model 21 loaders
4—Conway model 50A loaders
1—Conway model 60 loader
1—Gardner-Denver model 9 loader

COMPRESSORS

1—44 CFM Ingersoll-Rand
2—88 CFM Ingersoll-Rand
1—179 CFM Ingersoll-Rand
1—360 CFM Gardner-Denver, model WBH, with 75 HP motor
1—447 CFM Ingersoll-Rand
1—637 CFM Sullivan
1—698 CFM Union
1—900 CFM Ingersoll-Rand
1—840 CFM Laidlow
1—1418 CFM Ingersoll-Rand

PORTABLE COMPRESSORS

1—105 CFM Ingersoll-Rand, gas engine driven
1—105 CFM Worthington, gas engine driven
1—210 CFM Worthington, continental gas engine
1—250 CFM Gardner-Denver stationary, Buda gas engine
1—310 CFM Sullivan, Buda gas engine
1-310 CFM Gardner-Denver stationary, Buda gas engine

TUGGER HOISTS

1—D6U Ingersoll-Rand Utility Air Hoist
1—6HO Ingersoll-Rand Air Hoist
1—Sullivan Model G-112, driven by 15 HP Wisconsin gas engine

SLUSHER HOISTS

1—7½ HP Sullivan 2 Drum Slusher
1—10 HP Sullivan 3 Drum Slusher
1—Sullivan 2 Drum Model HD-10-B, driven by 30 HP Continental gas engine

BALL AND ROD MILLS

1—4' x 3' Marcy Ball Mill
1—5' x 4' Morse Ball Mill
2—6' x 48" Hardinge Conical Ball Mills
1—8' x 22" Hardinge Conical Pebble Mill
1—3' x 8' Marcy Rod Mill

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. P.O. Box 1708 Keystone 5261 DENVER, COLORADO

Attention . . .

EMPLOYMENT ADVERTISERS

Effective with the July issue, a new section will start in ENGINEERING & MINING JOURNAL. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisers will be billed at the rate of $16.00 per inch, unless on contract. Contract rates furnished on request. Advertisements are subject to Agency Commission.

For full information write:

ENGINEERING & MINING JOURNAL
CLASSIFIED ADVERTISING
330 West 42nd St.,
New York 36, N. Y.

POSITIONS WANTED

(Continued from opposite page)

Geologist, 5 years mining experience; mine, field, office, lab. Desires responsible position with aggressive company. Employed, available reasonable notice. PW-6323, Engineering & Mining Journal.

Mining Geologist, Manager, 33 years worldwide experience, member AIME., excellent references, employed, wants to change position. Fluent Spanish, Portugese, French, German. Will go anywhere, but Latin America, Canada or Middle East preferred. Available 3 months' notice. PW-6118, Engineering & Mining Journal.

Geologist-Engineer, 30—6 years varied field and mining experience. Desires responsible position with future where background will count. Metallic, non-metallic, or petroleum. Not just another job. Employed, available reasonable notice. Reply PW-6322, Engineering & Mining Journal.

BUSINESS OPPORTUNITIES

900 acres proven manganese lands in heart of Batesville-Cushman quadrangle. Will sell; might lease. Write Bee Vanemburg, Owner, Batesville, Arkansas.

For Sale uranium and copper claims—for full information write E. Windover Minden, Ontario, Canada.

Owner, will lease to responsible party. Good copper property. Chaffee County, Colorado. F. A. Thompson, 747 Church Lane, Yeadon, Pa.

WANTED

ANYTHING within reason that is wanted in the field served by Engineering & Mining Journal can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

COMPLETE BRIQUETTING PLANT

One complete 6-ton per hour Briquetting Plant complete with No. 920 "Clearfield" mixer, alloy steel roll briquette machine, skip hoist, troughing conveyors, and bucket elevator. All equipment includes drives, motors, and starting equipment, condition good.

FS 5845 Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

PLACER AND LODE GOLD MINE FOR LEASE

122 test holes on placer averaged 72 cents.
Lode mine, low grade, free milling. Placer and lode mines are of the same claims.
Enormous reserves. This property has real merit.

HOWARD RASER
Missoula, Montana

RELAYING RAIL

All Sizes
Track Accessories
LEFTON INDUSTRIAL CORP.
Genl. Office: 212 Victor St.
St. Louis 4, Mo.

DIAMOND DRILLS

Used underground air driven $450.00 cash, F.O.B. my shop. A Joy Mfg. HS-15 and a Chicago Pneumatic CP-5.

Write J. L. Havlick
112 S. Cedar St., Spokane 4, Wash.
Phone TEmple 1789

A.G.
DIESEL ENGINES • GENERATOR SETS
10 TO 2000 KW • AC&DC • GUARANTEED
SCHOONMAKER CO., INC.
30 CHURCH ST. NEW YORK 7, N. Y.
Plants: SAUSALITO(S.F.)CAL., JERSEY CITY, N.J.

DRYERS: 2—Heavy duty 104" dia., 65 ft. long, complete with furnaces, blowers, dust collectors, etc.

PAN FEEDER: Traylor heavy duty, 60" x 16 ft., complete with motor, speed reducer, etc. Weight 75,000 lbs. New Condition.

SINK FLOAT PLANT: Mobil 2-unit with two 7 ft. dia. HMS Separating Cones with screens, pumps, magnetic separators, densifiers, demagnetizing coils, piping, valves, framework, etc., with all control equipment.

JAW CRUSHERS: 48 x 60, 42 x 40, 36 x 48, 24 x 36, 18 x 30, with motors and drives.

SCREEN: Tyler Hummer type V-50, 4' x 5', double deck, fully enclosed, with Thermionic power converter. Guaranteed condition.

PULVERIZERS: Marcy 6' x 12', trunnion and bearing type, with 200 H.P., 440 volt, motor, with stone or steel lining. Hardinge 5' x 22" Ball Mill complete with motor driven disc feeder, 30 H.P. motor and control.

MINE HOISTS: Single and double drum 100 to 1500 H.P., with all electrical equipment. Complete specifications, drawings and photos available.

MINE HOIST SPECIALS: Nordberg 10' dia., 84" face, 1¼" rope, 1400 FPM, 1200 H.P. One Single drum 12' x 12', 600 H.P. Both with 2200 volt motors and controls.

HOIST MOTORS:
300 H.P., 435 RPM. 600 H.P., 710 RPM.
400 H.P., 588 RPM. 1200 H.P., 444 RPM.
2200 volt, A.C., with controls.

LOCOMOTIVE CRANE: Link Belt 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota For sale or rent.

OVERHEAD ELECTRIC TRAVELING CRANES: One 8 ton, 54 ft. span and one 10 ton 80 ft. span. Both 4 motor, bucket operating, 440 volt, A.C. Other cranes both AC and DC, various spans, 5 tons to 55 tons, 3 and 4 motor.

LOCOMOTIVES: 2—65 ton diesel electric, standard gauge, thoroughly modern, excellent condition. For sale or rent.

WE BUY AND SELL EQUIPMENT THROUGHOUT NORTH AND CENTRAL AMERICA

A. J. O'NEILL
Lansdowne, Pa.
Phila. Phones: MAdison 3-8300 — 3-8301

POWER PLANT

875 KVA Diesel Generator Set, Chicago-Pneumatic 1000 HP, 8 cyl., 4 cy., 327 RPM, 16" x 20", air start, direct coupled to:

General Electric 875 KVA, 700 KW, Alternator, 3/60/6900 volts, with belted exciter.

Including: Switchboard, starting air compressor, air tank, oil pump, controls, valves, oil filters, oil clarifier, gauges, pumps, intake and exhaust silencers, tools and spare parts.

Unused Gov't. Surplus Equipment, Ready to ship.

ALJON ELECTRIC DIESEL CO.
904 Pacific St. Brooklyn 38, N. Y.
STerling 3-6515

NEW

I R DRILL SHARPENERS

FOR SALE

Model IR-40, complete with shank and bit punch, shanking devices, dies dollies, gauges, punch pins and various other parts. Excellent condition. Priced at less than half of current cost. Packed for export.

F.S.-6298 Eng. & Mining Journal
330 W. 42 St., New York 36, N.Y.

COMPRESSOR DIRECTORY

World's Best Rebuilts

STATIONARY

12.7 CFM	1000 psi	2 stage Ingersoll 5 HP Elec
48.5 CFM	3500 psi	3 stage Ingersoll 25 HP Elec
122 CFM	100 psi	American 20 HP Elec
125 CFM	100 psi	6¼x4½ Davey VB8-6 Available
142 CFM	125 psi	8/6/5x5 Ingersoll Type 40—25 Elec
211 CFM	100 psi	9½ x 9 American 40 HP Elec
254 CFM	100 psi	10 x 10 Ingersoll ER-1 40 HP Elec
268 CFM	500 psi	10/4½x10 Ingersoll 75 HP Syn
278 CFM	125 psi	2 stage Chicago PB-50 HP Elec
285 CFM	125 psi	2 stage Gardner "WB" 50 HP
291 CFM	40 psi	3 cylinder Ingersoll Type 40
343 CFM	500 psi	11/8x18 Worth Elec or steam
348 CFM	100 psi	12-7½x8 IR-XRB
360 CFM	125 psi	12-7½x10 Penn
364 CFM	20 psi	12 x 7 Gardner "RX" 2 avail.
428 CFM	100 psi	12 x 11 Ingersoll ES-1 NL—Oil-less
428 CFM	100 psi	12 x 11 Ingersoll ES-1 75 HP Elec
460 CFM	125 psi	13/9x10 Ingersoll XRB—Duplex
510 CFM	125 psi	13/8x12 Ingersoll XRB—Duplex
678 CFM	125 psi	15/9½x12 Ingersoll XRB—Dup.
861 CFM	30 psi	17 x 11 Ingersoll ES-1
931 CFM	55 psi	17 x 13 CPT Elec or steam
1085 CFM	35 psi	20 x 12 Penn.3A 100 HP Elec
1292 CFM	35 psi	20 x 13 Chicago T-B 125 HP Elec
1574 CFM	100 psi	22-14x16 IR-PRE
1725 CFM	110 psi	"XPV" 4 corner Ingersoll steam

SPECIAL—Compressors for special air applications and conditions
PORTABLE—15 CFM to 600 CFM
VACUUM PUMPS—3 CFM to 5881 CFM
DELIVERIES—Always prompt.

American
AIR COMPRESSOR CORP
47th ST & DELL AVE. NORTH BERGEN N. J.
Telephone UNion 5-4848

SPECIALS

1—Allis-Chalmers 8' & 7' x 22' two Compartment mill & Motor.
2—New 6½' x 150' Kilns
1—26 Williams hammer Mill
1—New Traylor 5'-6" T.Y. Gyratory Crusher
1—125 HP—3/60/440V—450 RPM Squirrel Cage Motor
1—Complete Lime Hydrating Plant
1—Complete Plant consisting of 4½'x40' Kiln, 3'x30' Cooler, Supporting Steel Framework, Motors, Fans, Dust Collectors, etc.

KILNS

1—4' x 40', 7' x 120', 8' x 125', 8' x 150' Kilns

DRYERS

4½' x 30', 5½' x 40', 6' x 40', 6' x 60', 8' x 70', 8' x 123'

CRUSHERS

1—42"x48", 40"x42", 36"x42", 30"x36", 24"x36", 18"x36", 12"x24" Jaw Crushers
2—42" x 16" Allis-Chalmers Crushing Rolls
1—36" x 16" Sturtevant Crushing Rolls
2—24" x 14" Rogers Iron Works Crushing Rolls
1—24" x 12" Farrell Bacon Crushing Rolls
1—36" Telesmith Gyrosphere Crusher
1—No. 222, 322 Allis-Chalmers Type "R" Hydrocone Crushers
1—6", 10", 14", 16" and 20" McCully Superior Gyratory Crushers
36"—20" Traylor T.Y. Gyratory Crushers
No. 3 up to No. 12 Gyratory Crushers

BALL, ROD & TUBE MILLS

1—7' x 8', 6' x 12', 5½' x 10', 8' x 6' Ball Mills
2—5' x 16'; 1—5½' x 10'; 6' x 12' Rod Mills
2—5½' x 20' Tube Mills
2—6' x 22' Compeb Mills—6' x 22' Tube Mills
1—10' x 48', 8' x 48', 6' x 22" Hardinge Mills
3—3-Roll Bradley Hercules Mills, Direct Connected to 500 HP Motors

MISCELLANEOUS

1—6', 14' and 16' Air Separators
1—6' x 4', 6' x 8' & 12' x 10' Oliver Filters

W. P. HEINEKEN, INC.
ENGINEERS & MFGRS.
50 BROAD STREET, NEW YORK 4, N. Y.
TEL. WHITEHALL 4-4236
Have you any machinery that you want to sell?

1—850 HP Nordberg Single Drum, First Motion Mine Hoist, 1400 FPM, with D.C. motor drive and 3/60/2300 motor driven generator set.
1—400 HP Coeur d'Alene Tandem Double Drum Mine Hoist, 1000 FPM, 2—200 HP 3/60/2300 motor drives.
1—150 HP Coeur d'Alene Single Drum Mine Hoist, 875 FPM, 3/60/2300.
1—50 HP I-R 3 Drum Elec. Slusher.
1—30 HP I-R 3 Drum Elec. Slusher.
1—2200 Cu. Ft. Chicago-Pneumatic Compressor with 350 HP, 3/60/440 synchronous motor.
1—2000 Cu. Ft. I-R Compressor with 270 KVA, 3/60/440 synchronous motor.
3—8' x 36" Hardinge Conical Mills with 150 HP, 3/60/2200 slip ring motors.
2—8' x 26" Hardinge Conical Mills with 125 HP, 3/60/2200 synchronous motor.
1—7' x 36" Hardinge Conical Mill with 100 HP, 3/60/440 motor.
1—5' x 5' Cylindrical Mill with 75 HP, 3/60/440 motor.
1—Unused 34" x 20" Jeffrey Corrugated Crushing Rolls.
1—42" x 16" Chalmers & Williams Smooth Shell Rolls.
1—Traylor 10 x 20 Blake Type Jaw Crusher.
1—Oliver 8' x 10' Drum Filter.
1—Portland 8' x 6' Drum Filter.
1—6 Cell #18 Denver Flotation Machine.

ASK US ABOUT:

NEW "MISSOULA" DIESEL HYDRAULIC LOCOMOTIVES, 2½ Ton Size, 18 or 24" gauge

NEW PLYMOUTH UNDERGROUND DIESEL HYDRAULIC LOCOMOTIVES, 5, 6, 8 & 10 Ton, 24" ga. & up.

MILLER MACHINERY COMPANY
Box 1496 Phone 9-2309
Missoula, Montana

SAVE ON RAILS

BUY "GUARANTEED RELAYERS"

Handle more cars better — spend less to install & maintain with Foster Relayers. "Open-stock" shipments, all sections 12# thru 175#. Switch Materials, Track items.

Send catalogs ☐ *Rails* ☐ *Track Equipment*
☐ *Send Free 'Track Maintenance' Book*

RAILS - TRACK EQUIPMENT - PIPE - PILING
L.B. FOSTER co.
PITTSBURGH 30 NEW YORK 7
CHICAGO 4 HOUSTON 2 LOS ANGELES 5

ELECTRICAL **WIRE** AND **CABLE**

YOUR BEST SOURCE . . .
- for every industrial and power application
- odd lengths—long and short—reasonably priced
- One of the Largest Stocks in Midwest
Let us quote on requirements—send your inquiries
QUICK . . . from stock
We'll also buy your Surplus
Branch Offices: Houston — Yukon 5547
Los Angeles — ANgelus 3-5148
UNIVERSAL Wire and Cable Co.
2864 N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

USED—REBUILT MACHINERY

AERIAL TRAM LINE
½ mile long

BALL MILLS
1—#67 Marcy with 150 HP motor
2—4 x 5 Eimco and C.I.W. 40 HP
1—7 x 36 Hardinge 100 HP
1—6 x 18 Hardinge 50 HP
1—5 x 6 Allis Chalmers 60 HP
1—5 x 5 Eimco 75 HP
1—8 x 36 Hardinge 150 HP

CLASSIFIERS
1—8 x 26 Denver Duplex Rake
4—6 x 25 Dorr Duplex Rakes

CARS
30—18 cu. ft., 18 gauge, RB, Card trucks, new bodies

CONVEYORS
1—48" x 80' centers Magnetic headpulley
1—36" x 120' centers Jeffrey steel bridge frame and catwalk
1—20" x 56' Centers Link Belt
1—18" x 158' Centers, wooden frame
2—16" x 60' Belt Conveyors

CRUSHERS
1—9 x 16 Rogers Jaw
1—9 x 36 Cedar Rapids Jaw
1—2' Standard Symons cone
1—2' Shorthead Symons cone
1—36 x 16 Crushing Rolls
1—14 x 24 Crushing Rolls

COMPRESSORS
1—365 CFM Skid Mounted Electric
1—284 CFM 75 HP motor
1—445 CFM Skid Mounted D-13,000 diesel
1—500 CFM Skid Mounted D-13,000 diesel, almost new

ANNOUNCING!!!

NEW LIQUIDATION
350 TON MINE AND MILL
AT CAMPO SECO, CALIF.

WRITE FOR COMPLETE INVENTORY.

COMPLETE PILOT PLANT
1—18" x 24" Pioneer reciprocating feeder, plate type, excellent condition
1—Small 6" x 9" jaw crusher, almost new
1—Chipmunk type jaw crusher, 2¼" x 3", excellent
1—3' x 3' Stearns-Roger ball mill, excellent condition, extra set of new liners, 7½ HP gearmotor.
1—2' x 3' C.I.W. ball mill, good condition
1—3' x 8' rod mill, good liners. Set of rods and motor
1—24" x 12' Akins classifier, 3 HP motor
1—#7 Denver flotation unit cells, 6 units, like new
1—Wilfley laboratory concentrating table
1—4' x 5' Wemco thickener
1—4' Eimco single leaf filter, excellent condition
1—18" x 24" Denver Laboratory Conditioner
1—4' x 5' Wemco Conditioner

COMPRESSORS (Cont'd)
1—990 CFM I. R. 200 HP motor
1—900 CFM C. P. 200 HP motor

FLOTATION CELLS
2—6 cell #15 Denver Sub A
1—2 cell #18 SP Denver Sub A
1—2 cell #18 Denver Sub A
1—3 cell #18 Denver Sub A
3—4 cell #18 SP Denver Sub A

FILTERS
1—4" 1-leaf Eimco
1—6" 4-leaf American filter
1—12' x 14 Oliver drum type
1—14' x 18 Oliver drum type

GENERATING PLANTS—480 Volts
1—50 KW, International diesel
1—90 KW, D-1700 diesel
1—250 KW, GMC diesel
1—300 KW, GMC diesel

HOISTS—MINE SHAFT
1—40 HP single drum
1—50 HP single drum
1—100 HP single drum
1—125 HP single drum
1—150 HP single drum
1—225 HP single drum
1—400 HP single drum
1—600 HP single drum
1—300 HP Double drum

HOISTS—SLUSHER
3—HNN1J I. R. Air operated, 2-drum
1—Sullivan 2-drum CF211, 10 HP motor
2—I.R. 2-drum 20NM, 20 HP
4—I.R. 3-drum 25 NNN3D, 25 HP
1—Joy 25 HP 3-drum

LOCOMOTIVES
7—Mancha Titans, A & B, Rebuilt 18 or 24 gauge
1—Goodman 5-ton trolley 42" gauge
1—Plymouth

GOOD EQUIPMENT IS ALWAYS A BARGAIN

MACHINERY CENTER, INC.

808 Newhouse Building • Salt Lake City, Utah • Phone 3-3973

MINING, MILLING AND OPERATING MACHINERY, EQUIPMENT AND SUPPLIES OF THE PINE TREE, JENNY LIND AND HARVARD MINES, CALIFORNIA

Following are major items now available for prompt delivery at attractive prices:

AIR COMPRESSORS
877 cu. ft. I.R. X.C.B. 2 stage w/150 HP G.E. motor.
741 cu. ft. C.P. Mod. OCB 225 RPM 2 stage.
695 cu. ft. I.R. type XRB 2 stage w/100 HP motor.
464 cu. ft. C.P. Mod. OCB 14"x12".
600 cu. ft. I.R. type XB-2 w/100 HP motor.
387 cu. ft. G.D. ty. WBH 4001 w/75 HP motor.
385 cu. ft. I.R. Imp. type XB-10 w/60 HP motor.
285 cu. ft. G.D. WBQ 4008 w/50 HP motor.
315 cu. ft. Semi Portable Shramm diesel.

CONCENTRATING TABLES
3—No. 6 Wilfley

CAPACITORS
1—120 KVA 460 volt G.E. type CH-1-3 phase.
1—30 KVA 460 volt 3 phase G.E. type CH-1.

CLASSIFIERS
6'x25' Dorr Mod 62—Duplex w/5 HP motor.
54"x18' Dorr Mod C Duplex w/3 HP motor.
5'x14' Hardinge Counter Current w/5 HP motor.
27"x16' Dorr Mod D Simplex.

CRUSHERS—JAW
15"x36" Cedar Rapids w/60 HP motor VB drive.
20"x10" Pacific Alloy w/25 HP motor & drive.
9"x15" Allis Chalmers
8"x15" Pacific Alloys.

DRILLS, DRIFTERS, STOPERS, JACKHAMMERS,
Large stock including Drill Steel, Timken and I.R. Bits, Columns, Bars, Arms and Clamps.

DIESEL ELECTRIC GENERATING PLANTS
37½ KVA G.E. 3 phase 220/440 volt dir. con. 50 HP International Mod. PD-40 Mtd. on skids.
15 KW 3 phase Palmer Gen. Dir. Con. to Cat. Diesel Mod 4400.

FLOTATION CELLS
4—2 Cell Units Fagergren 56"x56" w/7½ HP motors.
2—3 Cell Units Fagergren 66"x66" w/15 HP motors.
2—1 Cell Units Fagergren 44"x44" w/5 HP motors.
1—2 Cell Pan America 48"x48" w/15 HP motor dual VB drive.
1—36"x36" Denver Sub A unit cell w/7½ HP motor.

FILTERS
1—11'6"x14' Oliver Acid proof w/Vacuum equipment and accessories.
1—4'—3 leaf American w/gear motor drive, Vac. Eqt. etc.

HOISTS
150 HP D.D. Mine type Herringbone gears, Post Brakes, Depth indicators, G.E. motor and Master Control Panel.
75 HP D.D. Ottumwa, post brakes, var. spd. mtr., Rev. Control Panel.
50 HP S.D. Ottumwa w/var. spd. mtr. and controls.
Large stock AIR HOISTS, I.R. Mod. DU-EU-HU, SULLIVAN Mod. F211.

HEAD FRAME
56' Steel with 56" heavy duty sheaves for ¾" rope.

LAMPS—MINERS CAP EDISON
54—Electric cap lamps Mod K w/3 cell approved Edison Batteries, G.E. Tungar rectifier Mod. G—115 volt AC-DC, charging rack 60 lamp capacity 3 MSA control panels, cables, Mod. E battery filler, etc.

BALL MILLS
8'x30" Hardinge Conical Ball Mill, good liners and 1 extra set NEW Manganese Steel liners w/150 HP slipring motor, VB drive and control.
7'x36" Hardinge w/good liners 100 HP slipring motor and control.
6'x4' Union Iron Works good liners and 75 HP motor and control.
5'x4' Marcy good liners.

MAGNETIC PULLEY
20"x20" Dings Magnetic w/2 KW 115 v., D.C.M.G. set.
12"x18" Dings Magnetic w/2 KW 115 v., D.C.M.G. set.

POWER UNIT
1—D-7700 Caterpillar Diesel Unit, Twin Disc, clutch and power take-off, 50 HP.

PUMPS
Large stock centrifugal, Sand and Tailings Pumps.

TRANSFORMERS
3—250 KVA 12500 to 2300/460 volt, G.E. form KDD.
3—50 KVA 2200 to 480 volt, G.E. type H Form K.
3—25 KVA 11000 to 2300/460 volt G.E. Form KR.
4—5 KVA 440 to 220/110 volt G.E. type H Form K.

PACIFIC MACHINERY & ENGINEERING CO.

420 Market Street—PH. SUtter 1-3493—San Francisco 11, California

ALPHABETICAL INDEX TO ADVERTISERS

(This index is published as a convenience to the reader. Every care is taken to make it accurate, but E&MJ assumes no responsibility for errors or omissions.)

Acker Drill Co., Inc. ... 186
Aero Service Corp. ... 140, 141
Allen-Sherman-Hoff Pump Co. ... Second Cover
Allis-Chalmers Mfg. Co. (General Machinery) ... 12, 13, 18, 28
Allis-Chalmers (Tractor Div.) ... 22
American Air Filter Co., Inc. ... 163
American Brattice Cloth Corp. ... 183
American Cyanamid Co. ... Insert between pp. 58-59
American Forge Co. ... 162
American Hoist & Derrick Co. ... 174
American Manganese Steel Div. American Brake Shoe Co. ... 10, 11, 198
American Steel & Wire Div. ... 48, 49
Anaconda Wire & Cable Co. ... 112, 113
Armour Chemical Div. Armour & Co. ... 170
Armstrong-Bray & Co. ... 190
Athey Products Corp. ... 188
Atlas Car & Mfg. Co. ... 172
Atlas Diesel AB ... 137

Baldwin-Lima-Hamilton Corp. (Construction Equip. Div.) ... 64
Baldwin-Lima-Hamilton Corp. (Industrial Locomotive Div.) ... 173
Barber-Greene Co. ... 190
Bemis Bro. Bag Co. ... 150
Bethlehem Steel Co. ... 33, 139
Birdsboro Steel Fdry. & Mach. Co. ... 200
Bixby-Zimmer Engrg. Co. ... 178
Booth Co., Inc. ... 178
Braun & Co., C. F. ... Insert between pp. 50-51
Brunner & Lay, Inc. ... 171
Bucyrus-Erie Co. ... 51
Buell Engineering Co. ... 144
Builders-Providence, Inc., Div. of B-I-F Industries Inc. ... 39

Card Iron Works Co., C. S. ... 126
Carrier Conveyor Corp. ... 169
Caterpillar Tractor Co. Insert between pp. 42-43, 222
Chicago Pneumatic Tool Co. ... 58A, 209
Christian Engrs., J. D. ... 215
Clark Equipment Co. ... 203
Cleveland Rock Drill Div. ... 165
Colorado Fuel & Iron Corp. ... 130
Columbia-Geneva Steel Div. ... 48, 49, 54, 55
Columbian Steel Tank Co. ... 208
Connellsville Mfg. & Mine Supply Co. ... 148
Continental Gin Co. ... 211
Coppus Engineering Corp. ... 179
Crane Co. ... 147
Crucible Steel Co. of America ... 34
Cummins Engine Co., Inc. ... 128, 129

Dart Trucks ... 221
Denver Equipment Co. ... 32
Detroit Diesel Engine Div. General Motors Corp. ... 143
Dings Magnetic Separator Co. ... 199
Dodge Mfg. Co. ... 62, 63
Dorr-Oliver, Inc. ... 8, 9
Dow Chemical Co. ... 47, 127
Ducon Co. ... 160
du Pont de Nemours & Co., Inc. (Explosives Dept.) ... 189
Duria-Werk Karl Kempf, K. G. ... 210

Eagle Iron Works ... 183
Eimco Corp. ... 16, 37
Elektrokemisk, A. S. ... 164
Engineers Syndicate, Ltd. ... 190
Ensign-Bickford Co. ... 43
Euclid Div. General Motors Corp. ... 145
Exide Industrial Division Electric Storage Battery Co. ... 153

Falk Corp. ... 135
Firestone Tire & Rubber Co. ... 133
Fisher Research Laboratory, Inc. ... 214
Flexible Steel Lacing Co. ... 136
Frazier Davis Construction Co. ... 174

Galigher Co. ... 123
Gardner-Denver Co. ... 14, 61
Garlock Packing Co. ... 154
Gates Rubber Co. ... 182
General American Transportation Corp. (Turbo-Mixer Div.) ... 213
General Cable Corp. ... 161
General Electric Co. ... 23, 24, 25
General Mills (Special Commodities Div.) ... 205
Georgia Iron Works Co. ... 142
Goodrich Co., B. F. ... 5
Goodrich Co., B. F. (Tire & Equip. Div.) ... 60
Goodyear Tire & Rubber Co. ... 57
Greensburg Machine Co. ... 164
Grinnell Co., Inc. ... 185
Gustin Bacon Mfg. Co. ... 157

Harbison-Walker Refractories ... 166, 167
Hardinge Co., Inc. ... 158
Harnischfeger Corp. ... Third Cover
Hazard Insulated Wire Works ... 177
Hendrick Mfg. Co. ... 214
Hoffman Laboratories, Inc. ... 184
Houston Technical Laboratories sub. of Texas Instruments, Inc. ... 191

Industrial Brownhoist Corp. ... 187
Ingersoll-Rand Co. ... 3
International Harvester Co. ... 46
International Harvester Co. (Drott Mfg. Corp.) ... 119
International Nickel Co., Inc. ... 59

Jeffrey Mfg. Co. ... 201
Johnson Co., C. A. ... 44, 45
Jones & Laughlin Steel Corp. ... 53, 152
Joy Mfg. Co. ... 29, 58

Kennedy-Van Saun Mfg. & Engrg. Co. ... 111
Koehring Co. ... 44, 45

LeTourneau-Westinghouse Co. ... 19, 20, 21
Link-Belt Co. ... 42

Mack Trucks ... 125
Macwhyte Co. ... 116
Manhattan Rubber Div. ... 50A
Marion-Osgood-General ... 149
McNally Pittsburg Mfg. Corp. ... 214
Merrick Scale Mfg. Co. ... 176
Mine Safety Appliances Co. ... 131

Naylor Pipe Co. ... 134
New York Air Brake Co. ... 175
New York Engineering Co. ... 214
Nordberg Mfg. Co. ... 26, 27
Northwest Engineering Co. ... 15
Nuclear Instrument & Chemical Corp. ... 208

Page Engineering Co. ... 172
Parsons Co. ... 44, 45
Pennsylvania Drilling Co. ... 215
Pittsburgh Lectromelt Furnace Corp. ... 193
Precision Radiation Instruments, Inc. ... 171

Raybestos-Manhattan, Inc. ... 50A
Riblet Tramway Co. ... 190
Roebling Sons Corp., J. A. ... 38
Rollway Bearing Co., Inc. ... 195
Roots-Connersville Blower Div. Dresser Industries, Inc. ... 138
Ryerson & Sons, Inc., J. T. ... 109

Sanford-Day Iron Works, Inc. ... 30, 31
Sauerman Bros., Inc. ... 132
Scandinavia Belting Co. ... 207
Searchlight Section ... 216-219
Sheffield Steel Corp. ... 206
Simplex Wire & Cable Co. ... 17
Smidth & Co., F. L. ... 204
Spang & Co. ... 146
Sprague & Henwood Inc. ... 65
Stearns Magnetic, Inc. ... 181
Stearns-Roger Mfg. Co. ... 124
Stephens-Adamson Mfg. Co. ... 56
Stratex Instrument Co., Inc. ... 178
Streeter-Amet Co. ... 210
Sturtevant Mill Co. ... 52
Superior-Lidgerwood-Mundy Corp. ... 215

Taylor-Wharton Iron & Steel Co. ... 168
Tennessee Coal & Iron Div. ... 48, 49, 54, 55
Texas Co. ... 6, 7
Texas Gulf Sulphur Co. ... 202
Thompson Products, Ltd. ... 208
Timken Roller Bearing Co. ... Fourth Cover
Traylor Engrg. & Mfg. Co. ... 50, 155
Turbo-Mixer Div. General American Transportation Corp. ... 205
Twin Disc Clutch Co. ... 121

Ultra Violet Products, Inc. ... 183
United States Rubber Co. (Tires) ... 159
United States Rubber Co. (Mechanical Goods Div.) ... 107
United States Steel Corp. ... 48, 49, 54, 55
United States Steel Export Co. ... 48, 49, 54, 55

Victaulic Co. of America ... 180
Vulcan Iron Works Co. ... 186

Walworth Co. ... 197
Warn Mfg. Co. ... 151
Wedge-Wire Corp. ... 176
West End Chemical Co. ... 192
Western Machinery Co. ... 156
Wheel Trueing Tool Co. ... 41
Wickwire Spencer Steel Div. ... 114
Wilfley & Sons Co., A. R. ... 66
Willys Motors, Inc. ... 150, 151

Yuba Mfg. Co. ... 122

PROFESSIONAL SERVICES ... 212

SEARCHLIGHT SECTION

(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
- Positions Vacant ... 215, 216
- Positions Wanted ... 216, 217
- Employment Services ... 216

BUSINESS OPPORTUNITIES
- Offered ... 217

PROPERTY
- For Sale ... 217

EQUIPMENT
(Used or Surplus New)
- For Rent ... 217
- For Sale ... 217-219

ADVERTISERS INDEX

Acme Personnel Service ... 216
Aljon Electric Diesel Co. ... 218
American Air Compressor Corp. ... 218
Directorate General of Petroleum Affairs & Mineral Resources ... 215
Foster Co., L. B. ... 218
Havlick Diamond Drilling Co., Inc. ... 217
Heineken, Inc., W. P. ... 218
Lefton Industrial Co. ... 217
Machinery Center, Inc. ... 219
Miller Machinery Co. ... 218
Morse Bros. Machinery Co. ... 217
O'Neill, A. J. ... 218
Pacific Machinery & Engineering Co. ... 219
Raser, Howard ... 217
Schoonmaker Co., A. G. ... 217
Skinner Ltd., Walter ... 215
Universal Wire & Cable Co. ... 218

MORE CYCLES PER DAY!

DART'S GREATER MANEUVERABILITY CAN CUT YOUR COSTS!

Look at this turning radius comparison:

22 Ton Truck "A"	Approx. 31' 7"
25 or 20 Ton DART	Approx. 22' 6"
Passenger Car	Approx. 22' 6"

DART

TONNAGE ENGINEERED TRUCKS

Waste motion in truck haulage kills profits. Thanks to DART engineering, you can put a stop to waste motion.

The combination of DART'S box girder frame, longer two-stage springs, and shorter turning radius combined with higher horsepower engines enables quick spotting at the shovel in the tightest quarters. Added to this efficiently operating combination, a torque converter drive (which is optional) makes smoother, faster operation.

A stop-watch comparison will convince you...DART TRUCKS can deliver more loads per day, more profits for you.

There's a DART man NEAR YOU who will give you the complete data on DART TRUCKS. Give us a call or write:

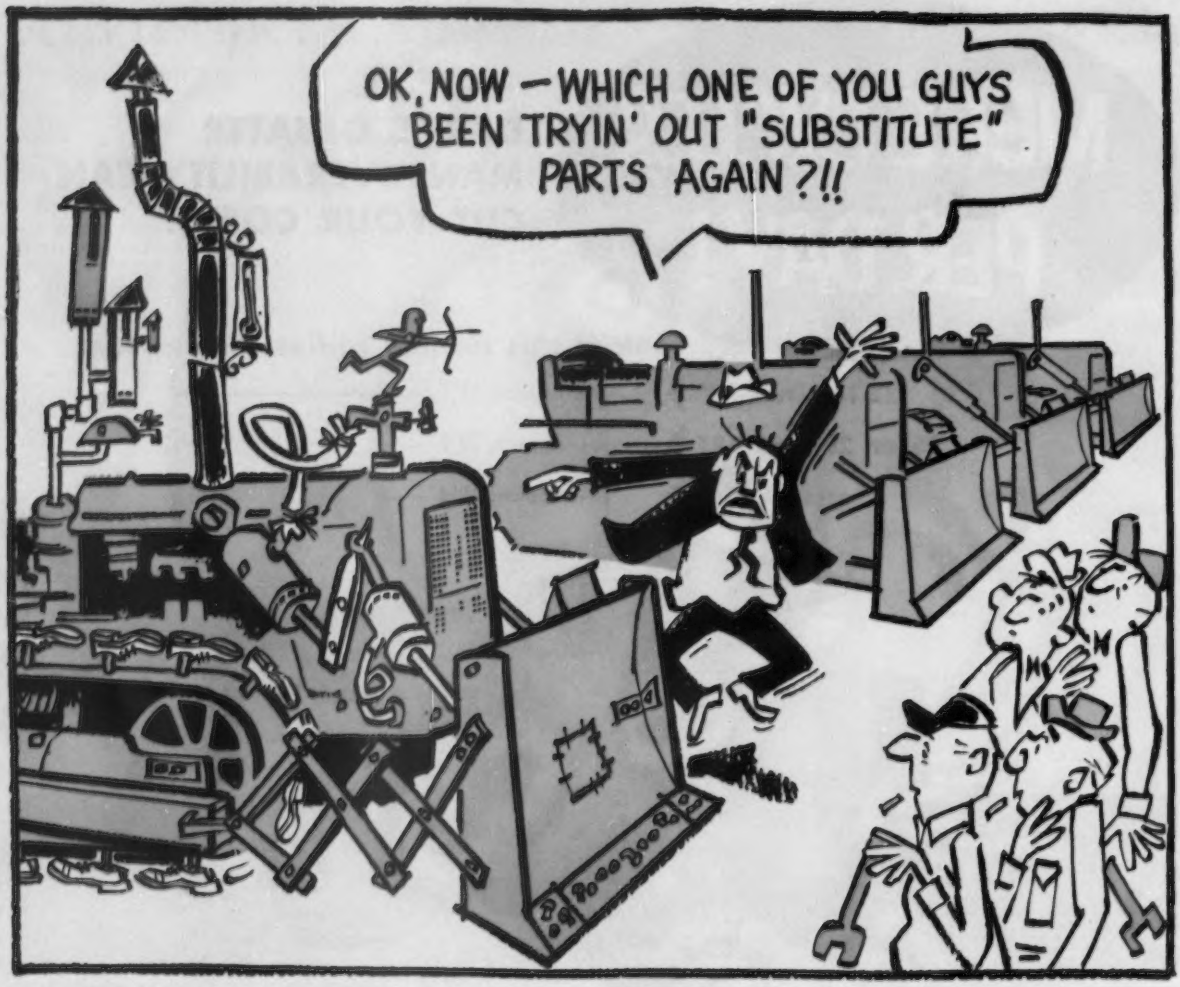
DART TONNAGE ENGINEERED TRUCKS
Kansas City 8, Missouri
SUBSIDIARY OF THE CARLISLE CORPORATION

3 MONEY-SAVING FEATURES:

15-SECOND DUMPING. Twin, single-stage, double-acting jacks raise the body to maximum dump position in just 15 seconds. Fully protected cylinders mean a clean, positive dump at all times under the most rugged conditions.

OPTIONAL TORQUE CONVERTER. The smooth-acting torque converter provides down-hill braking with compression. It means less brake, tire and road maintenance...assures faster starts; longer service life of transmission and engine.

TWO-STAGE SPRINGS—save money by reducing shock to all component parts of the truck. They provide greater tire-to-road contact and cushion the wear. Tires last longer.



Down time is no joke. Best way to avoid it is to insist on genuine CAT* parts every time. Then you're sure of getting parts that are made to the latest design, precisely manufactured of the right materials, rigidly inspected and tested.

Take track rollers, for example

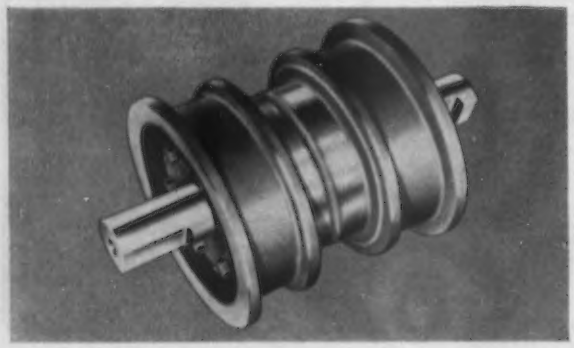
Some makes of track rollers may look alike—at first glance. But look closely at a genuine Cat roller: deep-hardened forged steel rims, center welded to prevent spreading... one-piece shaft... cast iron hub of high compressive strength to lessen bore distortion... specially alloyed bronze bearings... shaft wearing surfaces "Hi-Electro" hardened. With a substitute roller: who can be sure?

The difference on the job: with genuine Caterpillar-built track rollers you get extra trouble-free hours of profitable production, and top performance in even the worst working conditions.

With substitute parts: who can be sure?

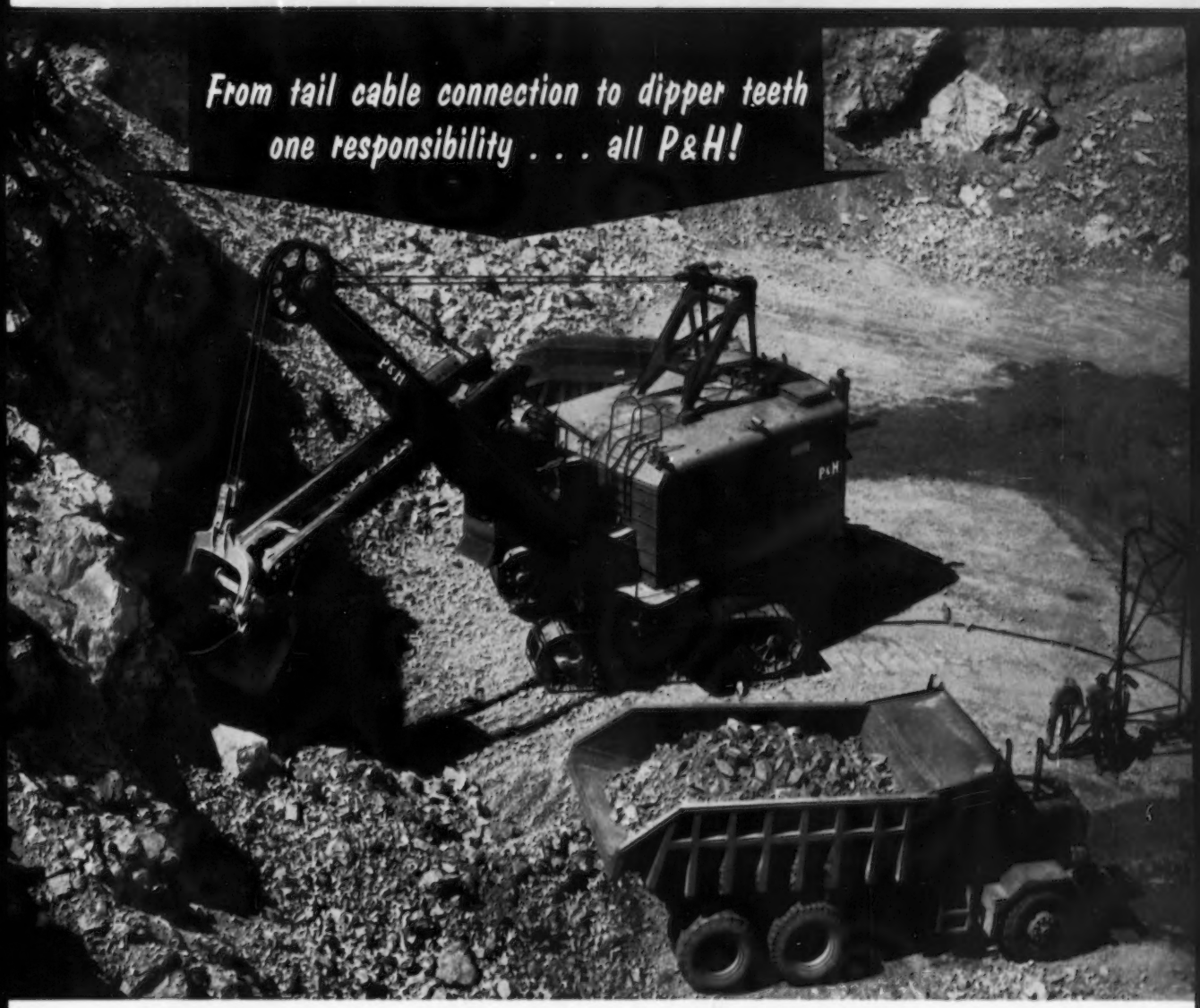
Better get genuine Caterpillar parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®



How P&H ELECTRIC SHOVELS cut tonnage costs with these two great features:

ELECTRONIC CONTROL — provides marked advantages over any other type of control available on electric shovels today. It's far easier, of course, and completely effortless. *Fatigue factor at end of shift is hardly discernible.* Response is faster. It is applied to all operating functions and arranged so the operator has co-ordination to get the utmost out of his shovel. Comparative tests indicate cycles 10% faster.

MAGNETORQUE* HOIST DRIVE — the electro-magnetic power transmission that provides faster dipper speeds at heavier bail pull. Higher torque is automatically produced at low speeds and vice versa. It enables you to come through the toughest banks with the smooth surge of power where other dippers falter or stall. It means extra production. Inherent slip characteristics cushion machine from impact stresses. Magnetorque is friction-free, worry-free; proved in over 1000 installations.

These two P&H exclusive features team up with many other advancements to give you still lower production costs in all kinds of open pit work. We have facts that speak volumes. You should have them. Write us. Ask to see the movie "Magnetorque Hoist Drive." P&H Electric Shovel Division, Harnischfeger Corporation, Milwaukee 46, Wisconsin.

*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

HARNISCHFEGER

the P&H Line

MAKE ONE DRILL STEEL DO THE WORK OF MANY!

TIMKEN® interchangeable rock bits let you switch bits without switching drill steels

IT pays to switch bit types as the ground changes. The most economical way to do this is to use Timken® carbide insert and multi-use rock bits. In less than a minute, drillers can unscrew one type of Timken bit and screw on a different one—right on the job. No time wasted going after another set of drill steels. No need to stock expensive double inventories because dozens of Timken carbide insert and multi-use bits are interchangeable on the *same* drill steel.

When you use Timken interchangeable rock bits, you know your drillers will always have the most economical bit for the ground being drilled—Timken multi-use bits for ordinary ground, Timken carbide insert bits for hard, abrasive ground.

Both of these Timken rock bits give you two important advantages: 1) they are made from electric furnace Timken alloy steel, 2) a special shoulder union keeps drilling impact from damaging threads.

Our rock bit engineers may be able to help you with your drilling problems. They're experts in cutting drilling costs. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant-gauge holes, small diameter holes, very deep holes.

. . . your best bet for the best bit . . . for <u>every</u> job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.